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Brockton Area Transit Development Program

June, 1975

Old Colony Planning Council



DANIEL M. CRANE
EXECUTIVE DIRECTOR

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June 1975

TO: The Participants in the Continuing,
Comprehensive, and Cooperative Transportation
Planning Process in the Old Colony Region

The accompanying document is the TRANSIT DEVELOPMENT PROGRAM (TDP) for the Old Colony Region. This work is the final product of a year-long Transit Technical Study which was funded by the Urban Mass Transportation Administration with in-kind services provided by the city of Brockton.

The completion of the TDP not only qualifies the Brockton area for capital grant assistance from the federal government but also delineates a five-year program for future transit development.

I wish to take this opportunity to express my appreciation to all who participated in this study. I feel the quality of the TDP is representative of the cooperation and enthusiasm of those who participated.

Very truly yours,

Daniel M. Crane
Executive Director

SERVING

ABINGTON	AVON	BRIDGEWATER	BROCKTON
EAST BRIDGEWATER	EASTON	HANSON	PEMBROKE
			WEST BRIDGEWATER
			WHITMAN



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Brockton Area Transit Development Program

June, 1975

Old Colony Planning Council

City of Brockton

Urban Transportation Systems Associates, Inc.

This report was prepared under grant number MA-09-0022 with the Urban Mass Transportation Administration of the U.S. Department of Transportation.

The opinions, findings, and conclusions expressed in this document are those of the authors and not necessarily those of the Urban Mass Transportation Administration.

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1.0 INTRODUCTION

1.0 INTRODUCTION

The primary objective in conducting this transit study and developing a transit plan was to prepare a comprehensive Transit Development Program to meet the present and future transit needs of the study area.

It was also an objective of this study to address in detail the transit needs of the elderly, handicapped, and low income residents of the area. The study considered all facets of transportation needs in the area, and has developed detailed recommendations.

The study area includes the Old Colony Planning Council (OCPC) region and the town of Stoughton, which is not a member of OCPC, but which is qualified by state statute to be a member of the Brockton Transportation Authority. Throughout this report the authority will be referred to as Brockton Area Transit (BAT).

Mass transit refers to the movement of people, by bus or train. The Brockton Area Transit Study has been concerned with such movement within the region and also from within the region to points outside the region.

Since the city of Brockton is currently the only member of BAT, first year study recommendations deal with bus service within the city. Recommendations for after the first year of implementation include bus service throughout the region. Recommendations for city and intra-regional services have been made so that an effective interface can be achieved with inter-regional bus and train services.

This report contains a summary of all surveys conducted and the material developed and analyzed as part of this study. In addition, it contains a detailed discussion of the recommendations, which include the purchase of capital equipment, financing the operation, the development of new bus routes, the need to develop new promotional programs, and a full-time management structure.

It is important to recognize that bus service is an extremely flexible form of transportation, and that the demand for transportation continually changes depending upon changes taking place in the communities being served. As a new apartment complex for the elderly or low income is constructed and inhabited, the demand for local service in that area increases. New shopping centers and employment facilities change the demand for transit service. To continually maintain an up-to-date Transit Development Program it will be necessary for the OCPC staff and the BAT staff to continually monitor the socio-economic changes taking place in the area, the ridership on the system as service is improved, and the impact promotional programs have on changing ridership. Continuing steps must be taken to encourage area residents to utilize the service. This effort will require imagination on the part of both BAT and OCPC, but only through this kind of effort can bus service be successful in the Brockton area.

1.1 Study Development

The promulgation of the Transit Development Program for the Brockton Transit Study Area was a joint effort on the part of the Old Colony Planning Council (Daniel M. Crane, Executive Director) and the Brockton Planning Department (Barry C. Canner, City Planner) with technical assistance from Urban Transportation Systems Associates, Inc. of Newton, Massachusetts. The Old Colony Planning Council acknowledges that this study would not have been possible without the assistance of the city of Brockton which provided the local share contribution toward the project grant.

Following is a partial list of the numerous agencies, organizations, local officials, and individuals who assisted in the preparation of the Transit Development Program:

- Old Colony Planning Council (OCPC)

<u>COMMUNITY</u>	<u>DELEGATE</u>	<u>ALTERNATE</u>
Abington	A. Stanley Littlefield (Treasurer)	Rodney D. Henrikson
Avon	John J. DeMarco (President)	Robert W. Pursley
Bridgewater	Anthony P. Anacki (Secretary)	Charles A. Dyke
Brockton	David E. Crosby	Paul Adams
East Bridgewater	Charles A. Benson	Paul Tesson
Easton	Richard H. Chase	Charles L. Hattaway
Hanson	Robert H. Kenyon	Thomas F. Horan
Pembroke	Gerald Dempsey	Peter C. Conley
West Bridgewater	Merton H. Ouder Kirk	Ronald P. Snell
Whitman	John F. Connolly	Michael Minnehan

- Joint Transportation Committee (JTC)

<u>NAME</u>	<u>TOWN</u>
Mr. Nick Carbone (Chairman)	Brockton
Dr. James DiNardo (Vice Chairman)	Bridgewater
Mrs. Barbara Easter (Secretary)	Bridgewater
Mrs. Pat Houle	Brockton
Mrs. Susan Allan	Whitman
Mr. Jack Hurley	Easton
Mr. Robert Moore	Brockton
Mr. John Yaney	Whitman
Mr. John Connolly	Whitman
Mr. Richard Dailey	Easton
Mr. Francis Giniewicz	Abington
Mr. Arthur Heidke	Avon
Mr. Charles Benson	East Bridgewater
Mr. Michael Sikora, Jr.	Hanson
Mr. Erland W. Thayer	West Bridgewater
Mr. C. Lee Kitchens	Pembroke
Mrs. Ann Ward	Brockton
Mrs. Frances Buckley	Brockton
Mr. Robert Patneau	Mass. DPW
Mr. Allen Jensen	Mass. DPW
Mr. John J. Carroll	Mass. DPW
Mr. Frederick E. Salvucci	EOTC

- Transit Study Steering Committee

<u>NAME</u>	<u>TOWN</u>
Mr. Francis Giniewicz	Abington
Mr. Arthur Heidke	Avon
Mrs. Barbara Easter	Bridgewater
Dr. James DiNardo	Bridgewater
Mr. Nick Carbone	Brockton
Mr. Charles Benson	East Bridgewater
Mr. Jack Hurley	Easton
Mr. Robert Kenyon	Hanson
Mr. C. Lee Kitchens	Pembroke
Mr. Richard Lindelof	Stoughton
Mr. Erland Thayer	West Bridgewater
Mr. John Yaney	Whitman
Mrs. Ann Ward	Brockton Council on Aging
Mrs. Frances Buckley	Brockton Council on Aging
Mr. Frank Mazzaglia	Self-Help, Inc.
Mr. Anthony Barchas	Brockton Traffic Commission

- Transit Study Technical Committee

<u>NAME</u>	<u>AGENCY</u>
Mr. Allan Jensen	Mass. DPW/District 7
Mr. Richard McGinn	Mass. DPW/BTP&D
Ms. Nancy Shapiro	Executive Office of Transportation and Construction
Mr. Louis Mraz	Urban Mass Transportation Administration
Mr. Donald Bell	Federal Highway Administration
Mr. Joseph Crocker	Crocker Transportation Services

The study staff primarily responsible for the completion of the study consisted of Wayne Hill, OCPC Transportation Planner, Theodore Welte, OCPC Planner, Charles Stevenson, City of Brockton, Planner; and Edward Bates, Consultant, Urban Transportation Systems Associates, Inc.

2.0 EVALUATION OF EXISTING CONDITIONS

2.0 EVALUATION OF EXISTING CONDITIONS

2.1 Review of Transit Service in the Brockton Area

At the time this study was conducted, local service was provided in the city of Brockton by nine buses with an average daily ridership of approximately 2,000, and an annual ridership of approximately 590,000. This is almost the smallest number of buses since before the Second World War, and, no doubt, the lowest ridership for that period of time. A number of factors have led to the reduction in ridership and consequently the reduction in service, the most important of which has probably been society's increased affluence and reduced dependency upon bus service.

Service in the entire study area is broken down into two levels: local service, which is provided only within the city of Brockton, and intercity or long haul service, which is provided between a number of towns in the Brockton area and other regional centers, especially Boston. Figure 2-1 is a display of the local bus routes in the city of Brockton as of January 1, 1975, and Figures 2-2 and 2-3 display the intercity bus routes in the Brockton area as of January 1, 1975. In addition to the local service provided in the city of Brockton, local service is also provided from the towns of Easton and Stoughton to downtown Brockton by Interstate Coach.

Frequency of Service

Service is provided by BAT from 6 A.M. to 6 P.M., on weekdays and Saturday. The weekday service frequency varies from half-hour service on six of the routes to 40-minute frequency on four of the routes. The service provided by Interstate Coach from Easton to Brockton has a frequency of one hour, and service is provided from 6 A.M. to 6 P.M. The Stoughton-to-Brockton service, also provided by Interstate Coach, has a frequency of one hour in the A.M. hours, and one and one-half hours in the P.M. hours.

Inventory of Rolling Stock

Following is an inventory of the rolling stock of BAT and Interstate Coach as of January 1, 1975. The average age of the nine buses owned by BAT is 11 years. Removing the two 1974 Flxettes, the average age is 16 years. The average age of the buses utilized by Interstate Coach is 11 years. One of these buses is a school bus painted dark green as the other Interstate Coach buses.

<u>Bus Number</u>	<u>Manufacturer</u>	<u>Year</u>	<u>Model</u>	<u>Number of Seats</u>
Brockton Area Transit				
7401	Flxible	1974	572KE-F74-19	23
7402	Flxible	1974	572KE-F74-19	23
475	GMC	1962	TDH4517	44
476	GMC	1962	TDH4517	44
478	GMC	1962	TDH4517	44
479	GMC	1962	TDH4517	44

Inventory of Rolling Stock (Cont.)

<u>Bus Number</u>	<u>Manufacturer</u>	<u>Year</u>	<u>Model</u>	<u>Number of Seats</u>
Brockton Area Transit (Cont.)				
	GMC	1955	TDH5105	51
	GMC	1955	TDH5105	51
	GMC	1955	TDH5105	51
Interstate Coach				
	Carpenter	1972	Gas	22
	GM Transit	1973	Diesel	33
	GMC	1961	Diesel	41
	GMC	1951	Diesel	45

Surveys Conducted

Three major surveys were conducted as part of the Brockton Area Transit Study. A Bus Passenger Survey was conducted to determine the bus ridership by route for the local service and a variety of characteristics concerning the present riders. A Home Interview Survey was conducted to obtain statistics concerning the average number of trips made by residents of the area for various purposes and by various modes. This survey was conducted in four towns including Brockton, during the months of July and August, 1974, and included 263 families. The third major survey conducted was an Attitude/Latent Demand Survey. This survey was mailed to a random sample of five percent of the families in the region and was intended to obtain attitudes towards the present service and types of improvements residents would like to see made. In addition, statistics were obtained concerning the areas where service should be expanded.

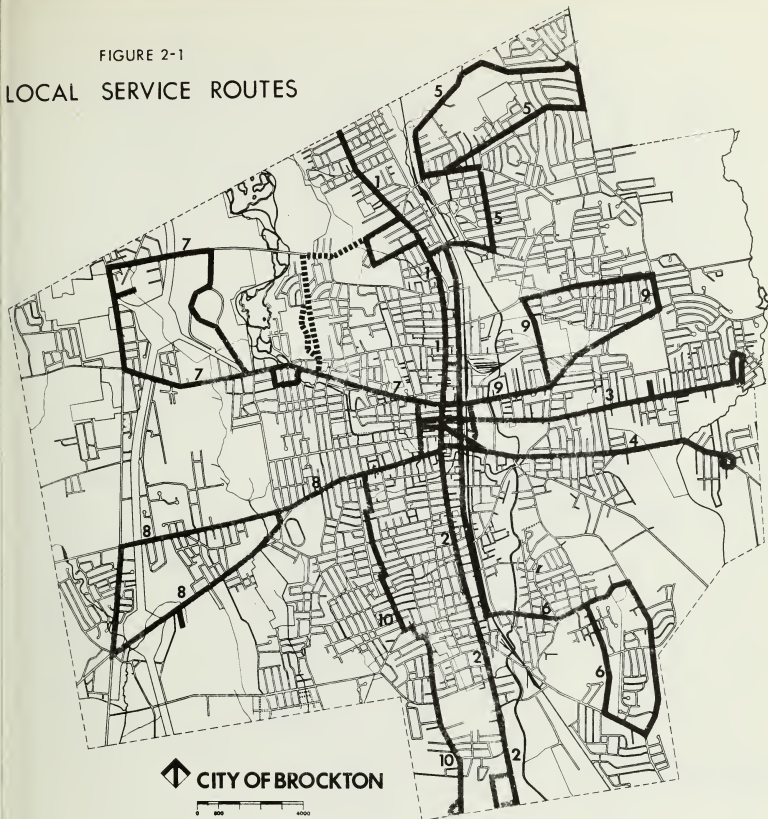
A number of supporting surveys were also conducted including: elderly transportation needs and attitudes; Spanish-speaking citizens' attitudes, and transportation services provided by special service agencies such as Self-Help, Inc. and the Home Care Center. Copies of each survey form used can be found in the Appendix.

Ridership: Table 2-1 is a summary of the average weekday ridership during October, 1974 for all bus service provided within the study area. The service provided by Crocker Transportation Service, Inc. and by Interstate Coach is the only local bus service. The remaining service listed on the table is intercity service. The bus routes within the region are shown in Figures 2-1, 2-2, and 2-3.

-Ridership Per Revenue Mile: A reasonably well-established measurement of the efficiency and effectiveness of local bus service is the ridership per revenue mile statistic. Simply, it is the summary of passengers carried for an average day on a specific route divided by the total revenue miles of service provided for the average day. Table 2-2 is a summary of passengers on each route; revenue, deadhead, and total miles, and ridership per bus mile for routes covered by Crocker Transportation and Interstate Coach.

FIGURE 2-1

LOCAL SERVICE ROUTES

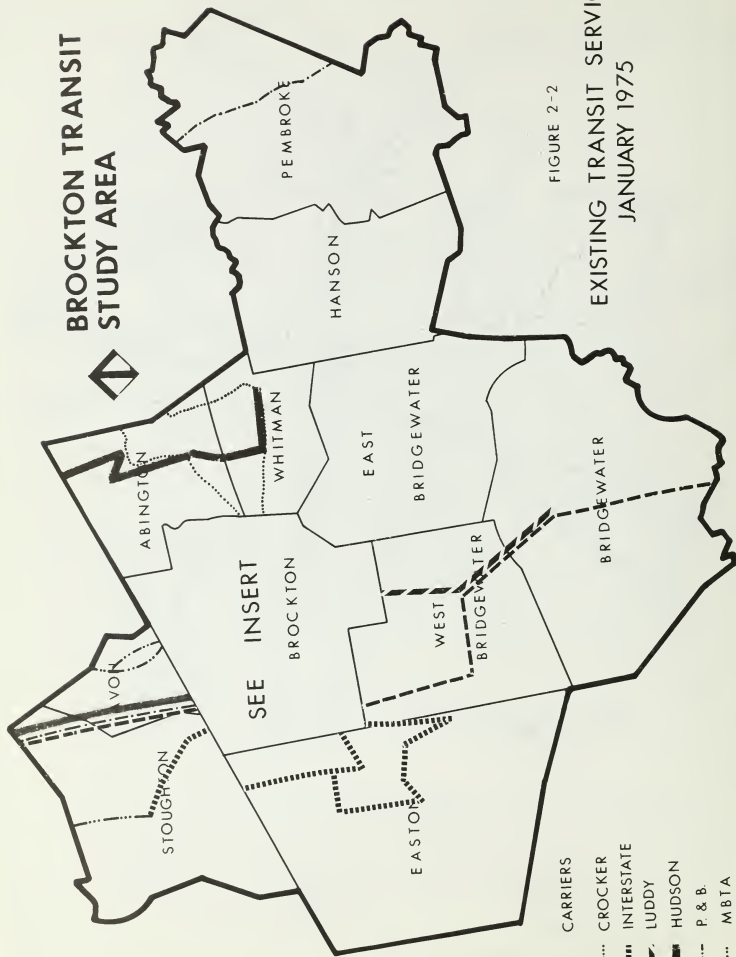


BROCKTON AREA TRANSIT ROUTES

- | | | | |
|---|----------|----|-----------------|
| 1 | MONTELLO | 6 | PERKINS |
| 2 | CAMPELLO | 7 | PLEASANT |
| 3 | CENTRE | 8 | BELMONT |
| 4 | CRESCENT | 9 | ASHLAND HEIGHTS |
| 5 | AMES | 10 | COPELAND |

■■■■ SENIOR SHUTTLE

BROCKTON TRANSIT STUDY AREA



CARRIERS

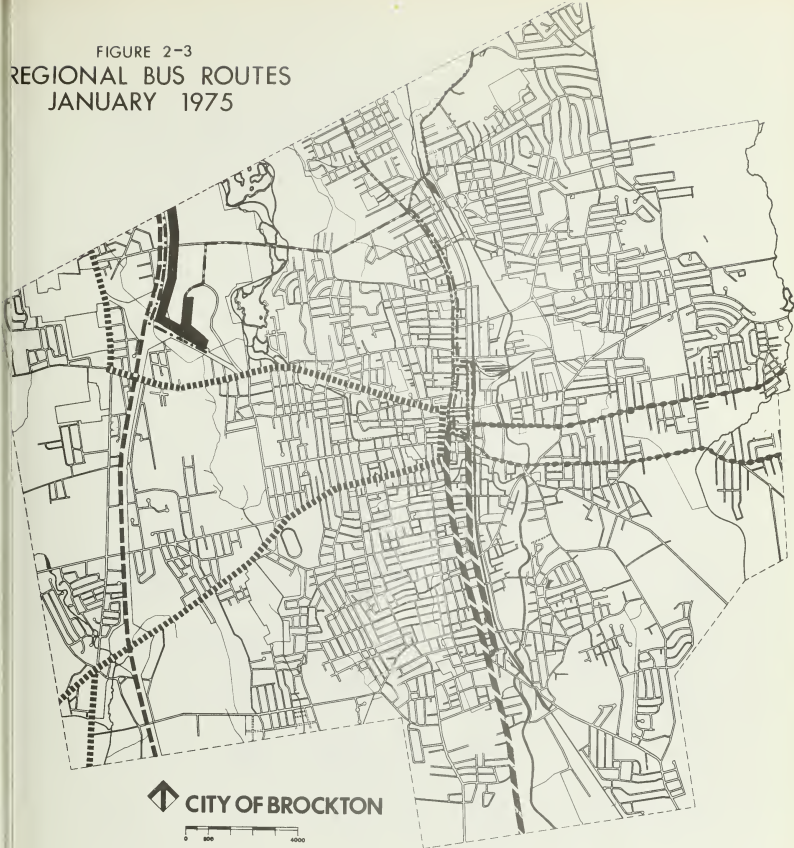
- CROCKER
- INTERSTATE
- LUDDY
- HUDSON
- P. & B.
- MBTA
- ALMEIDA
- BRUSH HILL

FIGURE 2-2

EXISTING TRANSIT SERVICE
JANUARY 1975

FIGURE 2-3

REGIONAL BUS ROUTES JANUARY 1975



CARRIERS

- CROCKER
- INTERSTATE
- LUDDY
- HUDSON
- - - - P. & B.
- - - - M.B.T.A.
- . - . ALMEIDA
- . . - BRUSH HILL

Table 2-1

Summary of Weekday Bus Ridership - October, 1974

<u>Operator</u>	<u>Passengers</u>
Crocker Transportation (BAT)	2171
Crocker Transportation (Rockland)	73
Interstate	178
Plymouth and Brockton	255
MBTA	723
Brush Hill	319
Hudson Limousine	14
Hudson Bus Lines	120
Almeida	515
Regional Total	4368

Table 2-2

Local Bus Route Statistics
October, 1974

<u>Route</u>	<u>Miles of Bus Operation</u>			<u>Daily Riders</u>	<u>Daily Riders/ Total Miles</u>
	<u>In Service</u>	<u>Dead Head</u>	<u>Total</u>		
Crocker Transportation					
Montello-Campello	255.4	2.6	258.0	680	2.6
Centre-Crescent	223.6	2.6	226.2	381	1.7
Pleasant-Belmont	245.3	5.0	250.3	588	2.4
Perkins-Ames	362.3	5.1	367.4	317	0.9
Copeland-Ashland	103.9	5.2	109.1	170	1.6
Brockton-Rockland	187.0	1.0	188.0	73	0.4
Senior Citizen	15.8	0.0	15.8	45	2.8
			1414.8	2244	1.5
Interstate Coach					
Easton-Brockton	136.7	8.8	145.5	74	0.5
Stoughton-Brockton	129.0	3.0	132.0	108	0.8
	265.7		177.5	178	0.7

The greater the ratio of ridership per revenue mile, the more effective the service. This statistic does not indicate the average number of people on the bus, but is used to indicate what the per-mile revenue of the route is in comparison to the cost of providing service on that route.

It is interesting to note from this data that in October 1974, the Montello-Campello route was the most utilized regular route with a ratio of 2.6 and the Rockland-Brockton route was the least, with a ratio of only 0.4.

-Bus Occupancy Analysis: Because the city has a number of very narrow streets, many complex intersections, and because many of the entrance ways into the elderly housing complexes will not accommodate large buses, there was a special interest in doing a detailed analysis of the possibility of utilizing smaller vehicles. Special counts were made of boarding and alighting passengers on those bus routes with the most passengers counted during the On Board Bus Survey. The counts were made by riding the buses and keeping count of the number of individuals who boarded and alighted within certain sections.

Later, a summary was made of the number of riders on board the bus for each section. Table 2-3 is a summary of the data collected during that survey. Basically, the table shows that the highest ridership on any bus was on the Montello-Campello route where on three occasions there were 24 riders on board. With an improved frequency, these riders would spread out over more buses. However, the improvement in frequency will encourage additional riders to utilize the bus service. Therefore, on many heavily-traveled routes, it is questionable whether small buses would be adequate to meet the increased demand. Figure 2-4 is a display of the number of riders on board the Montello-Campello route buses. The "highest ridership" indicates the greatest number of passengers counted on any run, and the "average ridership" is an average of all runs during the survey period.

-Ridership by Time of Day: In a bus study of this type it is important to determine the time of travel to and from work. The Home Interview Survey conducted in the study area shows the time people traveled to and from work. Figure 2-5 is a graph of the time of day at which the interviewees traveled to work. From this graph, it is obvious that the majority traveled to work between 6:00 and 8:00 in the morning, which becomes the A.M. peak period for work trips.

In addition to knowing the times for work trips, the study was used to calculate the times that individuals traveled on shopping trips. Figure 2-6 is a display of those trips, and Figure 2-7 is a display of the times people traveled for all trips. Also as part of the Home Interview Survey, trip data were collected by purpose. Table 2-4 is a summary of the number of trips by purpose collected during the survey, and the percentage each trip purpose was of all trips.

To assist in analyzing the need for vehicle size, data collected from the On Board Passenger Survey was summarized by hour. The summary was made by the time the bus left the terminus of the trip. That is, all buses on the Montello-Campello route leaving either Montello or Campello between 6:00 and 6:59 were accumulated for the 6:00 to 7:00 period. Figure 2-8 shows the hourly ridership for all routes serviced by Crocker Transportation.

Bus Passenger Surveys: The Bus Passenger Survey for the services provided by Crocker Transportation was conducted on October 22, 1974 on all routes for the full day of operation. A more complete discussion of the techniques

Table 2-3

Highest Ridership by Route and Run
(for selected routes)

<u>Route</u>	<u>Run</u>	<u>Number of Riders</u>
1 Montello-Campello	6:15 A.M. to Campello	24
	7:15 A.M. to Campello	24
	12:15 P.M. to Montello	24
2 Centre-Crescent	1:15 P.M. to Centre	15
	2:45 P.M. to Crescent	15
3 Pleasant-Belmont	7:50 A.M. to Belmont	23
	2:30 P.M. to Pleasant	25
4 Perkins-Ames	2:50 P.M. to Perkins	15
5 Copeland-Ashland	8:40 A.M. to Ashland Heights	10
	9:40 A.M. to Ashland Heights	10
6 Senior Citizen	11:00 A.M. to Main & School	26
7 Brockton-Rockland	3:00 P.M. to Rockland	9

Table 2-4

Home Interview Trip Purpose - Unfactored

<u>Purpose To</u>	<u>Number of Trips</u>	<u>Percent All Trips</u>	<u>Percent After Removal of Home Trips</u>
Work	291	14.2%	23.4%
Shopping	299	14.6	24.0
School	6	0.3	0.5
Medical	24	1.2	1.9
Social	174	8.5	13.9
Recreational	88	4.3	7.2
Other	211	10.3	16.9
Serve Passenger	151	7.4	12.2
Home	<u>807</u>	<u>39.3</u>	<u>-</u>
	2051	100.0%	100.0%

FIGURE 2-4

NUMBER OF RIDERS ON BUS AT ONE TIME
MONTELO - CAMPELLO ROUTE

SOURCE - ON-OFF COUNTS 11/22/74
NOON TO 6 P.M.

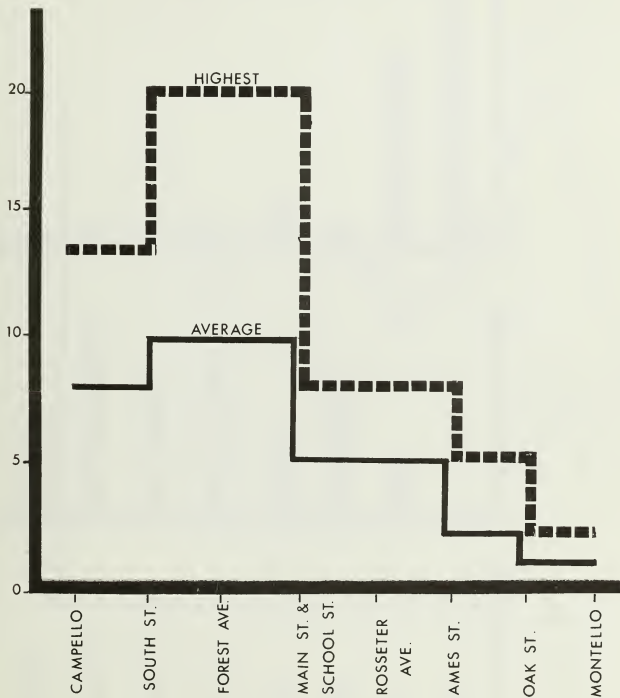


FIGURE 2-5
HOME INTERVIEW
SURVEY



FIGURE 2-6
HOME INTERVIEW
SURVEY

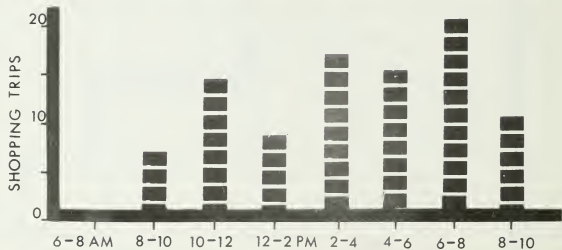


FIGURE 2-7
HOME INTERVIEW
SURVEY

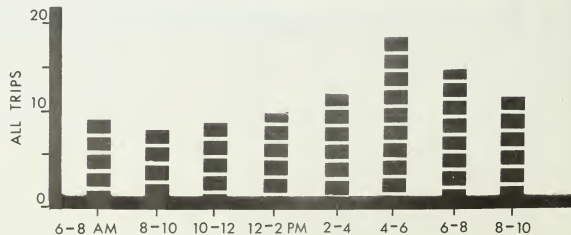
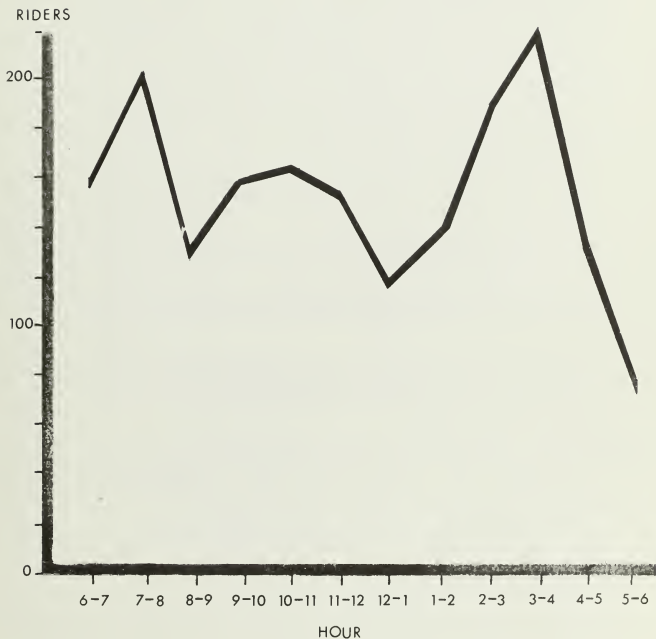


FIGURE 2-8

BUS RIDERSHIP BY HOUR
TOTAL ALL ROUTES FOR ALL NON-SCHOOL SERVICE PROVIDED
BY CROCKER TRANSPORTATION



and procedures for this survey can be found in Staff Paper No. 1. The survey for the service provided by Interstate Coach was conducted on November 12, 1974 for its two bus routes. The data collected on the Easton-Brockton route required additional analysis to determine its validity, and therefore the data for that route was discarded and an On-Off Survey was conducted on November 26, 1974, to provide the needed data. Ridership on the other companies, which for the most part are interregional, was collected by on-off counts at specific locations and through head counts made by the companies themselves. As noted, these ridership figures are shown in Table 2-1.

Dependability: The results of the Dependability Survey for service provided by Crocker Transportation showed that out of 101 buses checked at Main and School Streets, 65 percent left on time (that is, left between 0 and 1 minute of the scheduled time), 25 percent were 2 to 5 minutes late in leaving, and 11 percent left early. Another important statistic developed from the Dependability Survey is the average layover time. These data show that the average layover by route ranges from 4 minutes for Grafton and for Montello, to 9 minutes for the Ames route. There were fewer than 50 passengers per day who traveled through the downtown area on the same bus. The number of passengers traveling through downtown was useful in making further recommendations concerning the fare structure.

In addition to the checks made on service provided by Crocker Transportation, checks were made on all other service provided in the Brockton area. For example, a survey of service provided by Interstate Coach showed that of the 14 buses timed on the day of the survey, 28 percent were on time, 36 percent left Main and School Streets ahead of schedule, and 36 percent left late. Of the 13 Plymouth-Brockton buses checked, 69 percent left on time, 23 percent left early, and eight percent were 2 to 5 minutes late. It was interesting to note that the average layover on the day of the survey was 25 minutes for the Plymouth-Brockton route, and between 11 and 16 minutes for the Interstate Coach Easton route.

The MBTA runs from Ashmont and Quincy to Brockton were late in arriving at Main and School Streets most of the time, and the degree of lateness increased as traffic picked up during the afternoon hours.

Present Fare Structure

The present fare structure has not changed since the operation was initiated in September, 1973. The basic fare is 25¢. For passengers boarding the bus headed toward Main and School Streets (the center of the city), the rider pays when boarding. On buses traveling outbound, that is, away from Main and School Streets, the passenger pays 25¢ when leaving the bus. Therefore, an individual traveling through Main and School Streets pays a total of 50¢.

Students have the opportunity to buy tickets from the driver (10 tickets for \$1.50 or 15¢ a ride). Students without tickets are required to pay the regular fare. The elderly fare is 15¢. This applies to individuals 60 years of age and older. Proof of age is an elderly identification card with the person's picture on it which is provided by the city of Brockton.

For Interstate Coach, the fare is 30¢ if the trip is made within one town, and 50¢ if a passenger travels between towns.

Labor Costs

The drivers for Crocker Transportation are unionized. In October, 1974 they received \$4.12 per hour, and have a contract requiring a cost of living adjustment every three months. At present, the fringe benefit costs which include retirement, unemployment, social security, vacation and sick time amount to 85¢ per hour.

Previous Promotional Programs

Since the present operation was initiated in September, 1973, there has not been a significant amount of promotion.

On one occasion the Chamber of Commerce sponsored a newspaper coupon promotion in conjunction with a downtown sidewalk sale. The rider had the opportunity to remove the coupon from the newspaper for a free ride on the bus. BAT paid for the newspaper advertisement and the Chamber of Commerce reimbursed the operator for the coupons. In addition, BAT has printed schedules twice. The first time the printing was for 2,000 copies at a cost of \$300. The most recent printing, in September, 1974, was for 4,000 copies at a cost of \$500. In addition, BAT has developed a mini-bus service announcement to describe changes and improvements in service. These "service announcements" are mailed to those organizations and agencies which could get the most use from the service. They have been successful in informing the elderly of service changes.

School Bus Service

There are presently three types of school bus service in the city of Brockton. They are:

1. Students, especially high school students, who use a regular fixed schedule service. The Belmont Street route carries most of these students.
2. Trippers service provided by the BAT, for which the students pay 15¢ fares using the ticket books. These routes are provided for students living less than one and one-half mile from their school.
3. Free school bus service to students living more than one and one-half mile from their schools is provided by 62 school buses operated by Carey Motor Trans Inc. of Whitman under contract with the Brockton School System.

There are specific requirements when using federal money for improving transit service provided exclusively for school trips. Federal money is provided for a public service as opposed to an exclusive service such as school bus service.

An investigation of school bus service was made within the city of Brockton for that service provided by Crocker Transportation. It was found that there were approximately 400 students carried daily on school bus trippers, and that service would probably continue under special Department of Public Utilities permit.

The possibility of utilizing school buses to carry public transit passen-

gers was also investigated. It was concluded that there is basically no advantage in utilizing school buses to carry public passengers. Following are a number of reasons why this conclusion was reached:

1. School buses do not lend themselves to public service. That is, they have molded, harder seats which are built smaller to accomodate the students.
2. School buses are not available during the morning peak periods when buses are needed to meet the needs of the public.
3. There is really no cost savings in utilizing school buses. The buses are kept in service more hours per day and therefore wear out much faster.
4. Most of the cost of rolling stock is paid for by the state and federal governments.

2.2 Financial Status of the Operators

Both transit operators in the region, Crocker Transportation and Interstate Coach, are receiving financial support in providing local bus service. Crocker Transportation is being subsidized by BAT with the assistance of the Commonwealth, and Interstate Coach is being subsidized for its Easton-Brockton service by the town of Easton. In addition, Interstate Coach provides school bus service for the town of Stoughton, and local service from Stoughton to Brockton.

In that both operators of local service are being subsidized for the services that they provide, there is not an issue as to whether they are financially capable of continuing to provide service. In fact, local service will not be provided unless public agencies such as BAT, the local communities, and state and federal governments are willing to underwrite the service. Consequently, an exhaustive investigation and analysis was not made concerning the financial stability of either operator.

There is always the possibility that the present operator, because he contracts with BAT to provide service, may not be the operator in the future. That is, BAT will have the opportunity to contract with another operator if there is an operator who can provide the service more efficiently.

Revenue

Figure 2-9 displays BAT revenue for the average weekday, beginning with August 5, 1974, and ending on January 31, 1975. A slight increase in revenue appears over that period of time.

Figure 2-10 shows total weekly revenue receipts, and as in Figure 2-9, shows an overall increase for the period. This increase is not due to increases in the level of service, because basically there have been none. The increase is probably due to minor changes in routing, the acquisition of two new mini-buses, and the holiday season.

Figure 2-11 shows revenue by day of the week. All weekdays are about the same; Saturday has slightly lower ridership and less service. Table 2-5 shows the revenue receipts by route for the Brockton service for Monday, February 3, 1975.

Table 2-5

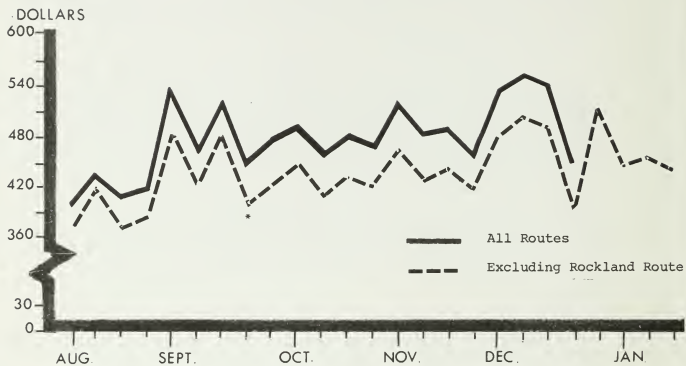
Receipts by Route - Monday, February 3, 1975

<u>Route</u>	<u>Income</u>	<u>Ridership</u> ¹
Ames-Perkins	\$ 43.40	201
Crescent-Centre	81.55	379
Grafton-Ashland Heights	11.75	55
Senior Citizen	10.00	66
Belmont-Pleasant	148.20	689
Montello-Campello	188.20	875
	\$483.00	2265

1 Ridership calculated using an average fare of 21.5¢

FIGURE 2-9

REVENUES FOR THE AVERAGE WORKDAY (MONDAY THRU FRIDAY)



* Four-day week due to holiday

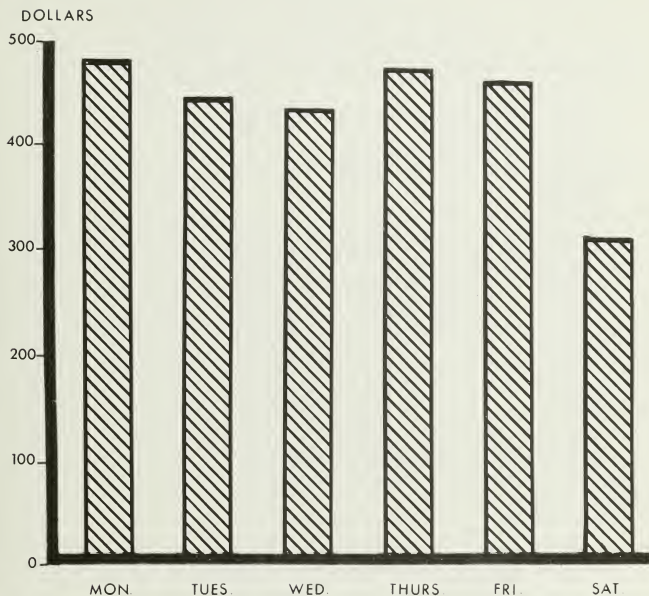
FIGURE 2-10



* Five-day week due to holiday

FIGURE 2-11

AVERAGE DAILY RECEIPTS - 8/5/74 - 10/26/74
(INCLUDES ROCKLAND ROUTE)



A detailed analysis was made for service provided by BAT for the months of December, 1974 and January, 1975. Table 2-6 shows the revenue for that period of time, the bus miles of service, and the cost per bus mile of service. The table shows that cost per bus mile was approximately 85¢ and the cost of providing service for the two-month period per passenger was approximately 50¢. The cost of service for an average hour for the two-month period was \$9.77.

Table 2-6

Operating Statistics for December, 1974 and January, 1975¹

Average Monthly Revenue for December, 1974-January, 1975	\$10661.
Average Monthly Revenue for September, October, November, 1974	9617.
Total Revenue December, 1974-January, 1975	\$21324.45
Total Weekday Revenue	\$19202.95
Average Weekday Revenue (44 days)	\$ 436.43
Total Saturday Revenue	\$ 2121.50
Average Saturday Revenue (8 days)	\$ 265.18
Average Daily Riders at 21.5¢ Average Fare ²	
Weekdays	2030
Saturday	1233
Bus Miles of Service (BAT)	
Average Weekday	1240.3
Average Saturday	542.0
Total Bus Miles of Operation	
Weekdays	54573.2 miles
Saturdays	4336.0
Total	58909.2 miles
Revenue per Bus Mile of Service	
<u>\$21324.45</u>	=
58909.2 miles	\$0.3620
Subsidy per Bus Mile of Service	
<u>\$18600.³</u>	=
58909.2 miles	0.3157
Other City Costs per bus mile of service	
<u>Ins. and Fuel⁴</u> = $\frac{\$2880 + 7000}{58909.2}$	= <u>0.1677</u>
Total Costs per bus mile of service	\$0.8454
Total Passengers	
<u>\$21324.24 Rev.</u>	= 99100 Passengers
21.5¢ Avg. Fare	
Total Cost for Service	
<u>Revenue + Subsidy + Other City Costs</u>	= $\frac{\$49804}{99100}$ = \$0.502
Annual Hours of Operation (BAT only - excluding school service)	
December, 1974-January, 1975	75 Hours 5095.2
Total Cost of Service Per Hour	
<u>\$49804.</u>	= \$9.77
5095.2	

1 Source of financial data - BAT; data does not include school tickets

2 Developed from revenue and ridership statistics

3 See table 2-8 page 26 - monthly subsidy of \$9,300 times two months

4 See table 2-8

For service provided by Interstate Coach, the study was able to obtain financial data from the town of Easton. Easton subsidizes Interstate Coach operations within the town.

Table 2-7 is a summary of financial and ridership statistics for the months of November and December, 1974 for Interstate Coach. Figure 2-12 is a display of the average daily bus ridership plotted by month, showing the Easton passengers boarding Interstate Coach from Easton to Brockton.

Table 2-7

Statistics for Easton-Brockton Route

Total Ridership	2169
Total Subsidy	\$2456.00
Total Revenue	<u>1075.25</u>
Total Income	\$3531.25

Average Fare per Passenger	\$0.50
Subsidy per Passenger	<u>1.13</u>
Cost per Passenger	\$1.63

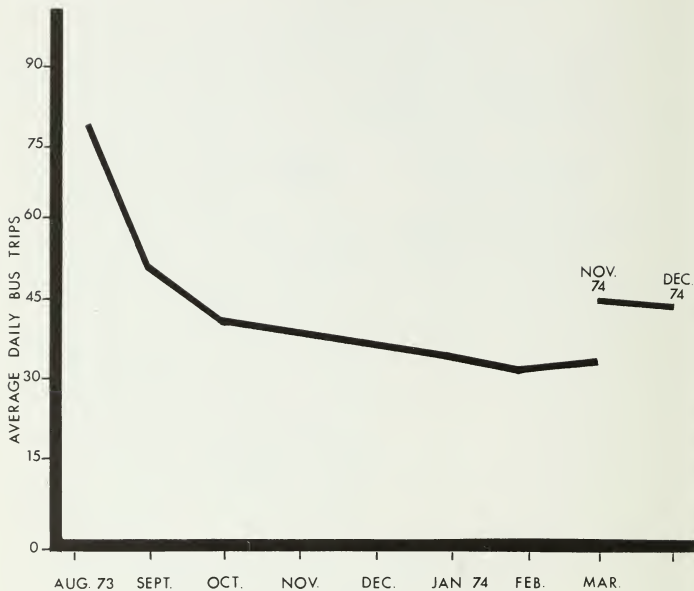
Daily Revenue Miles in Easton 71.0
Total Miles of Service for November and December
50 days x 71.0 miles/day = 3550 miles

Per Mile Cost of Revenue Service = \$0.99

Passengers per Revenue Mile = 0.61

FIGURE 2-12

AVERAGE DAILY BUS TRIPS BY MONTH -
EASTON PASSENGERS ON UNDA SERVICE



The Brockton Transportation Authority (herein referred to as Brockton Area Transit) was established in September, 1974 with the city of Brockton as the only member. Although there was an effort on the part of the OCPD and the city to encourage other towns to join, not enough towns decided to join to meet Sections 5 and 11 of state Chapter 1141. Therefore, BAT was formed by the city of Brockton under Section 3 of Chapter 1141. There is a renewed effort underway to encourage additional communities to join, especially as a result of this planning program.

From July 1, 1974 to December 1, 1974, the city provided the operator with \$60,000 to subsidize its operations. Starting on December 1, 1974, the city, through BAT, qualified for state funds to assist in subsidizing service. It is estimated that the total cost of subsidizing service from December 1, 1974 through June 30, 1975 will be \$108,325, and that BAT's share will be \$49,841. Table 2-8 is a copy of the projected budget developed by BAT which was used to determine state and city shares.

Projected Budget for Brockton Area Transit

Outlays

<u>Subsidy:</u>	To Crocker Transportation	
	7 months @ 9,300/month =	\$ 65,100.00
<u>Insurance:</u>	Bodily injury, property damage, fire and theft	
	Yearly premium, 1/75 - 12/75	17,284.33
	December '74 premium	1,440.36
<u>Fuel:</u>	7 months @ 3,500/month =	24,500.00
Projected Gross Outlays		<u>\$108,324.69</u>

Insurance policy rebate, 6 months	\$ 8,642.17
State aid (ch. 1141)	49,841.26
Net Cost to City	<u>\$ 49,841.26</u>

The budget illustrated in Table 2-8 was based on the fact that Crocker Transportation kept all system revenue to offset its expenses. Federal assistance was not anticipated for this period of time. The above budget was used to maintain the 10 route Brockton system that was in operation at the time.

2.4 Transit User Characteristics

This study has included an analysis of the service presently being provided and an inventory and analysis of the socio-economic characteristics of the present riders. To some extent, having this information assists in determining where new bus routes should be located and aids in estimating what the new ridership will be with improved service.

To determine what the existing ridership characteristics are, an On Board Bus Survey was conducted for both the service provided by Crocker Transportation and Interstate Coach. The results of the survey of Crocker Transportation riders are found in Table 2-9.

As can be observed from these data, a very high percentage of the riders are elderly. Very few of the riders are handicapped; the reason being that the handicapped individual has a difficult time walking to or from the bus stops, waiting for the bus, and then mounting the bus steps. An objective of this study was to develop local bus service which would further improve the service to the elderly and handicapped. In effect, many of the elderly in the urban part of the study area are presently without any local service at all, and the handicapped are in need of a more disability-oriented vehicle and service. For example, in many handicapped cases, the vehicle must pick up the individual at the place of residence, and in a number of cases, it will be important for the vehicle to have a wheel chair lift. The recommendations concerning the elderly and handicapped are discussed in more detail later in the report.

On Board Survey Statistics

The On Board Survey of Crocker Transportation riders resulted in 1144 survey forms filled out, coded, keypunched, and summarized for the study. Following are comments concerning those statistics:

How did you get to the bus stop? Approximately 49 percent walked only one block, while an additional 25 percent walked two blocks, accounting for 74 percent of the riders. This statistic is very similar to statistics developed in other surveys, that is, if fixed schedule service is provided, it must be within two city blocks of the user's place of residence. This statistic suggests that bus routes should be rather close together, approximately four blocks in the more heavily populated areas.

What is the main purpose of your trip? Work trips accounted for 42 percent of the riders' travel. This is a considerably lower percentage than many areas similar to the Brockton area. Some areas are as high as 75 percent. From one point of view, it shows that service is being utilized throughout the day and the system is not being built around the peak hours. Further, these figures suggest that an effort should be made to encourage employee ridership in peak periods through employer promotional programs.

Captive Ridership: Captive ridership is defined as that rider who has no other modal choice in making a trip other than using bus service. That is, it is an individual without a driver's license or without an automobile available, either of these for a variety of reasons. The statistics shown in the tables under "Do you have a driver's license?" and "If you have a

license, was an automobile available for your use?" show that the captive ridership is at a minimum 84 percent of the riders using the service. This is not unusual for operations the size of the Brockton area, but does emphasize the need to develop a system which will encourage non-captive riders to utilize the service.

What is your age? The 26 percent over 64 years is a lower percentage than most staff members believed was the case.

What is your sex? The 73 percent female ridership is, to some extent, directly related to the "captive" rider type of statistic. That is, if cross tabulations were made, it is likely that a high percentage of the females would lack either the availability of an auto or would not have a driver's license. Many of them are probably the second worker in one-car families or are individuals on shopping trips in families with only one car.

Table 2-9

Summary of On Board Bus Survey
(for service provided by Crocker Transportation)

Riders on Day or Survey: 1754

Surveys Returned: 1144

65% returned

Results of Questions

How did you get to bus stop?

Walked one block	49%
Walked two blocks	25%
Walked 3+ blocks	18%
Drove	4%

If you have a license, was an auto available for your use?

Yes	16%
No	84%

What is main purpose of your trip?

Work	42%
Shopping	29%
School	8%
Medical	7%
Social	4%

How often do you take the bus?

Daily	59%
1-4 times per week	20%
Less	21%

Do you have a driver's license?

Yes	22%
No	78%

What is your age?

Under 14	2%
15 to 19	16%
20 to 24	8%
25 to 34	10%
35 to 64	39%
Over 64	26%

How many autos are available in family?

None	55%
One	31%
Two	10%
Three	4%

What is your sex?

Male	27%
Female	73%

2.5 Region-Wide Socio-Economic Characteristics and Potential Transit User Groups

A major part of the study was an analysis of a variety of social and economic population characteristics conducted in an effort to predict the demand for transit service. The sources of these statistics were the Home Interview and Latent Demand Surveys which were done as part of this study, and U.S. Census data available from both published information and Journey-to-Work print-outs. All the socio-economic data collected and analyzed was drafted into displays to show those areas most in need of transit service. Statistical summaries of socio-economic information for all towns in the study area are found in Table 2-10.

Population Growth

As many of the graphics in this section show, Table 2-11 points out that Brockton is by far the most populated town in the study area, and is the economic center of the region. Bus service in the past has radiated from the center of Brockton. Based on anticipated population changes in the future, Brockton will remain the population and financial center of the region.

The Home Interview Survey conducted as part of this study, accumulated some rather interesting statistics, presented in Table 2-12.

Figures 2-13 and 2-14 show the population density within the study area. Density is measured in terms of persons per square mile, and has been calculated on a Basic Analysis Zone level (BAZ's are similar to and often equivalent to Census Tracts). The figures show that the greatest density is in the Brockton area. This statistic was developed and analyzed because densely populated areas demand the greatest level of transit service.

Many of the housing complexes for both elderly and low income were plotted and related to bus routes. A list of major housing developments can be found in Table 2-13, and they are plotted in Figures 2-15 and 2-16.

Median Family Income

In addition to looking at a variety of other socio-economic statistics already discussed, it is important to consider the median family income of small areas, in this case, Journey-to-Work zones. Families having a low income are not likely to have automobile transportation available to them, and are therefore more likely to require bus service. Figures 2-17 and 2-18 show that the concentrations of low median family income are within the city of Brockton, and point to this need for a higher degree of urban bus service in that area.

Employment

Figures 2-19 and 2-20 show the density of employment in the area. That is, employees per square mile by place of work. These figures reflect the need for bus service at the work end of the bus trip. Population densities, elderly concentrations, minority concentrations, and median income all show the need for bus service at the residence end of the trip. It is employment concentrations and shopping centers, hospitals, and entertainment facilities

Table 2-10

1970 Town Statistics

Town	Square Miles	Pop.	Pop./ Sq. Mi.	Min. Pop.	% Min. Pop.	Over 65	Over 65 Sq. Mi.	Median Family Income	# Fam. Income > \$6,000	# Autos	Autos / 1,000 Pop.
Abington	9.70	12,334	1,272	45	0.4%	1,008	104	\$11,566	376	5,043	410
Avon	4.35	5,295	1,217	71	1.3%	359	83	12,032	150	2,226	420
Bridgewater	27.29	11,829	433	339	2.9%	979	36	11,005	418	4,652	394
Brockton	21.37	89,040	4,167	2,525	2.8%	9,778	458	10,377	5,278	33,782	380
E. Bridg.	17.28	8,347	483	56	0.7%	743	43	11,119	255	3,179	383
Easton	29.04	12,157	419	76	0.6%	922	32	11,674	368	5,138	421
Hanson	15.17	7,148	471	249	3.5%	526	35	11,224	177	3,043	429
Penbrooke	21.53	11,193	520	115	1.0%	613	28	10,998	312	4,724	422
W. Bridg.	15.49	7,152	462	50	0.7%	566	37	11,238	197	2,527	351
Whitman	6.70	13,059	1,949	97	0.7%	1,220	182	10,952	425	5,371	410
OCPC TOTALS	167.92	177,554	1,057	3,623	0.2%	16,714	100	NA	7,956	69,685	392
Stoughton	16.25	23,559	1,450	448	1.9%	1,682	104	11,699	694	8,888	377
BATS TOTALS	182.71	201,083	1,101	3,170	1.6%	18,396	101	NA	8,650	78,573	391

Source: U.S. Census - 1970; Auto Data from R.L. Polk and Co.

Table 2-11
Population in 1970 and 1974

	<u>1970</u>	<u>1974¹</u>
Abington	12,334	14,276
Avon	5,295	5,473
Bridgewater	11,829	15,921
Brockton	89,040	98,640
East Bridgewater	8,347	9,422
Easton	12,157	14,879
Hanson	7,148	7,690
Pembroke	11,193	12,535
West Bridgewater	7,152	7,622
Whitman	<u>13,059</u>	<u>13,859</u>
OCPC Totals	177,554	200,317
Stoughton	<u>23,529</u>	<u>29,604</u>
BATS Totals	201,083	229,921

1 Estimates made using housing permits

Table 2-12

Partial Results of Home Interview Survey

	<u>NUMBER</u>	<u>PERCENT</u>
Number of persons in dwelling unit with driver's license (Avg. = 1.85)		
None	31	11.8
One	54	20.5
Two	124	47.1
Three	38	14.4
Four	11	4.2
Five	3	1.1
Six	2	0.8
How many blocks to the nearest bus stop (Avg. = 1.54)		
One	102	38.8
Two or Three	49	18.6
Four or more	112	42.6
How many autos available for family use		
None	31	11.8
One	96	36.5
Two	106	40.3
Three	25	9.5
Four	3	1.1
Five	2	0.7
What is the range of annual income of family		
\$0 to 4,999	37	14.6
5,000 to 7,999	28	11.0
8,000 to 9,999	24	9.4
10,000 to 14,999	72	28.3
15,000 to 19,999	56	22.0
20,000 and over	37	14.6

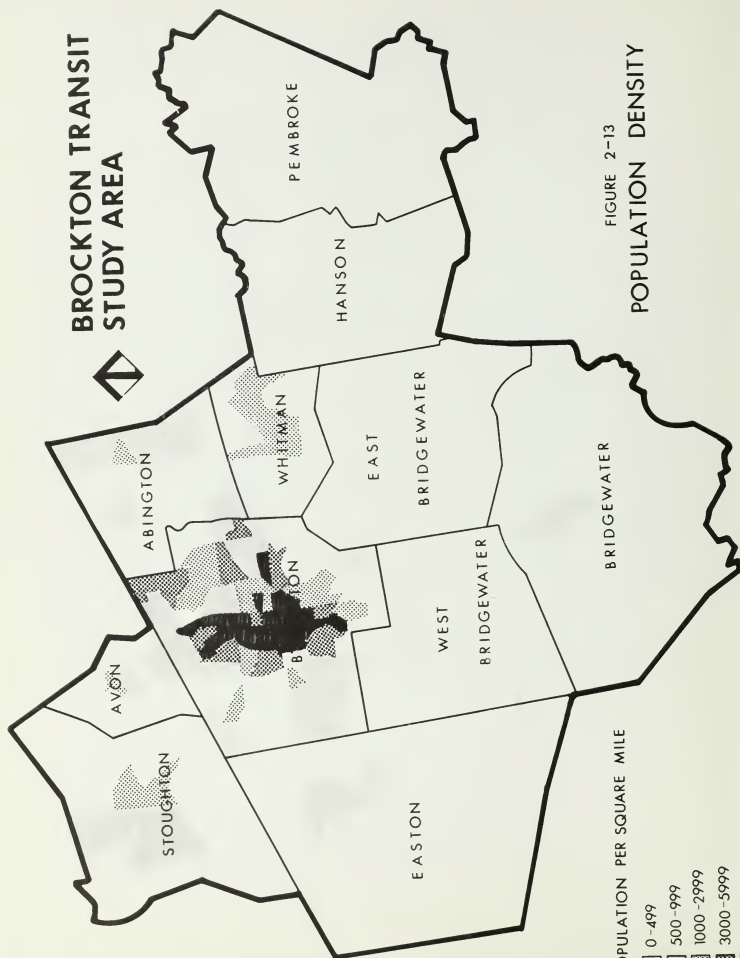
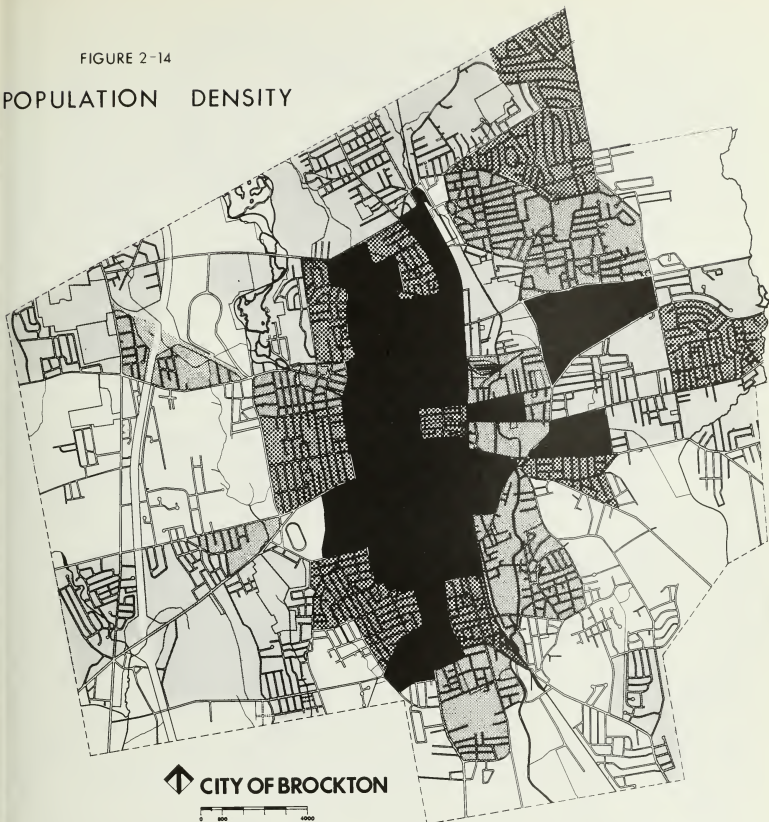


FIGURE 2-13
POPULATION DENSITY

FIGURE 2-14

POPULATION DENSITY



POPULATION PER SQUARE MILE

- ☐ 0-1999
- ☐ 2000-3999
- ☐ 4000-5999
- ☐ 6000-9999
- ☐ 10000+

Table 2-13

Public Housing Developments

<u>NO.</u>	<u>Name</u>	<u>Type</u>	<u># Units</u>	<u>Comments</u>
<u>Brockton</u>				
B1	South Main High Rise	Elderly	400	
B2	Caffrey Towers	Elderly	318	
B3	Belair High Rise	Elderly	215	
B4	Sullivan Towers	Elderly	122	
B5	Kennedy Drive	Elderly	120	
B6	Manning Towers	Elderly	100	
B7	Belair Apartments	Elderly	100	
B8	Rainbow Terrace	Elderly	64	
B9	Golden Circle	Elderly	46	
B10	Crescent Court	L&M	124	
B11	Hillside Village	L&M	100	
B12	Roosevelt Heights	Vets	124	
B13	Washburn Heights	Vets	50	
B14	Battles Farm Village	L&M	400	25% Low - 50% Modera
B15	Pine Grove I	L&M	114	25% Low - 75% Modera
B16	Pine Grove II	L&M	288	25% Low - 75% Modera
B17	Southfield Gardens	L&M	300	25% Low - 50% Modera
B18	Chatham West I	L&M	300	25% Low - 35% Modera
B19	Chatham West II	L&M	280	Under Construction
<u>Abington</u>				
AB1	Lincoln Boulevard	Elderly	40	
AB2	Shaw Avenue	Elderly	80	Proposed
AB3	Shaw Avenue	Low Income	10	Proposed
<u>Avon</u>				
AV1	Fellowship Circle	Elderly & Handicapped	90	
<u>Bridgewater</u>				
B1	Hemlock Drive	Elderly	96	
<u>East Bridgewater</u>				
EB1	Ridell Towers	Elderly	48	
EB2	Ridell Towers	Elderly	?	Proposed
<u>Easton</u>				
E1	Elsie Circle	Elderly	64	
E2	Elsie Circle	Elderly	80	Under Construction
<u>Hanson</u>				
H1	Liberty Street	Elderly	?	
<u>Pembroke</u>				
P1	School Street Project	Elderly	56	
<u>Whitman</u>				
W1	Stetson Terrace	Elderly	40	
W2	Hayward	Elderly	?	Proposed

BROCKTON TRANSIT STUDY AREA

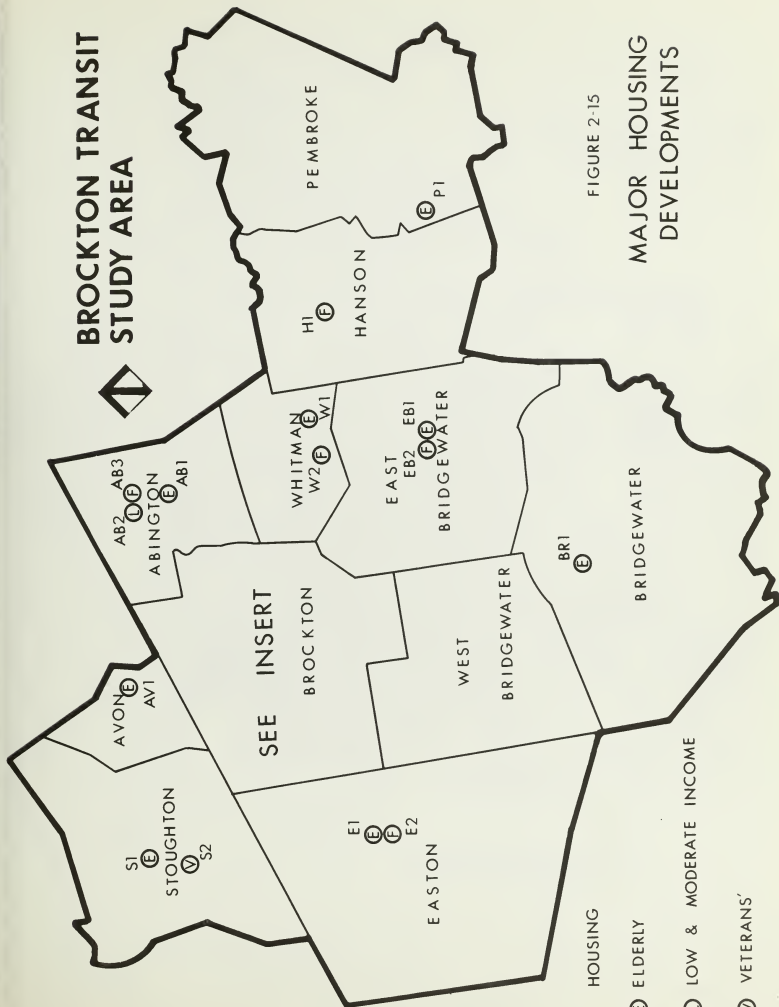


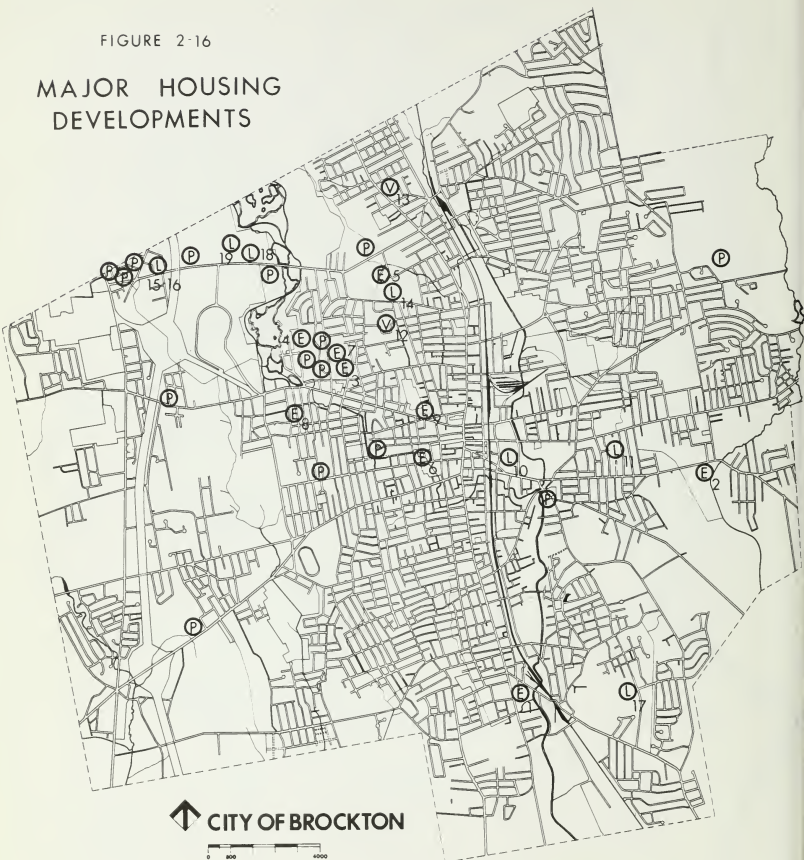
FIGURE 2-15

MAJOR HOUSING DEVELOPMENTS

- Ⓔ ELDERLY
- Ⓐ LOW & MODERATE INCOME
- Ⓥ VETERANS'
- Ⓛ FUTURE

FIGURE 2-16

MAJOR HOUSING DEVELOPMENTS



↑ CITY OF BROCKTON

0 500 1000

(E) ELDERLY

(P) PRIVATE

(L) LOW & MODERATE INCOME

(F) FUTURE

(V) VETERAN'S

BROCKTON TRANSIT STUDY AREA

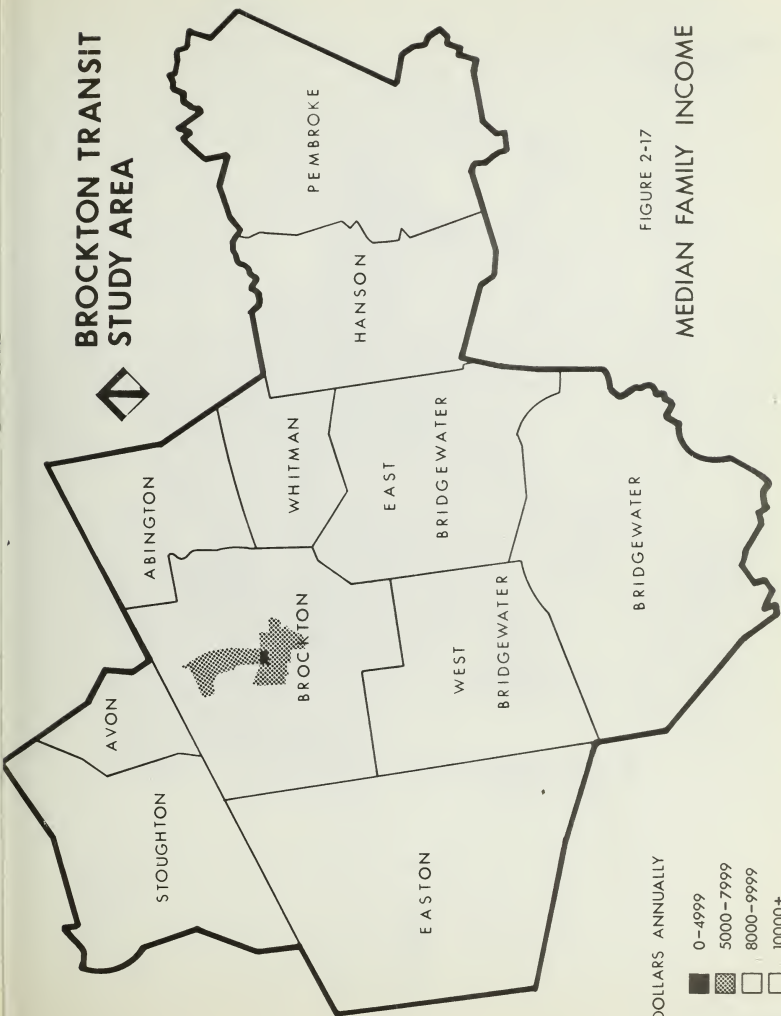


FIGURE 2-17

MEDIAN FAMILY INCOME

DOLLARS ANNUALLY

0-4999

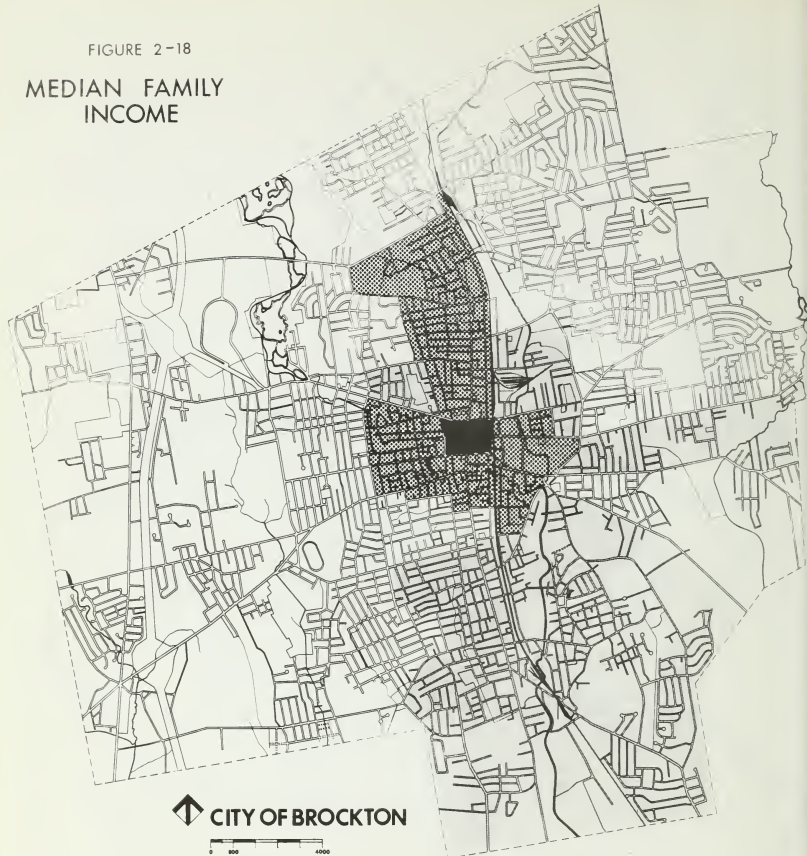
5000-7999

8000-9999

10000+

FIGURE 2-18

MEDIAN FAMILY INCOME



DOLLARS ANNUALLY



BROCKTON TRANSIT STUDY AREA

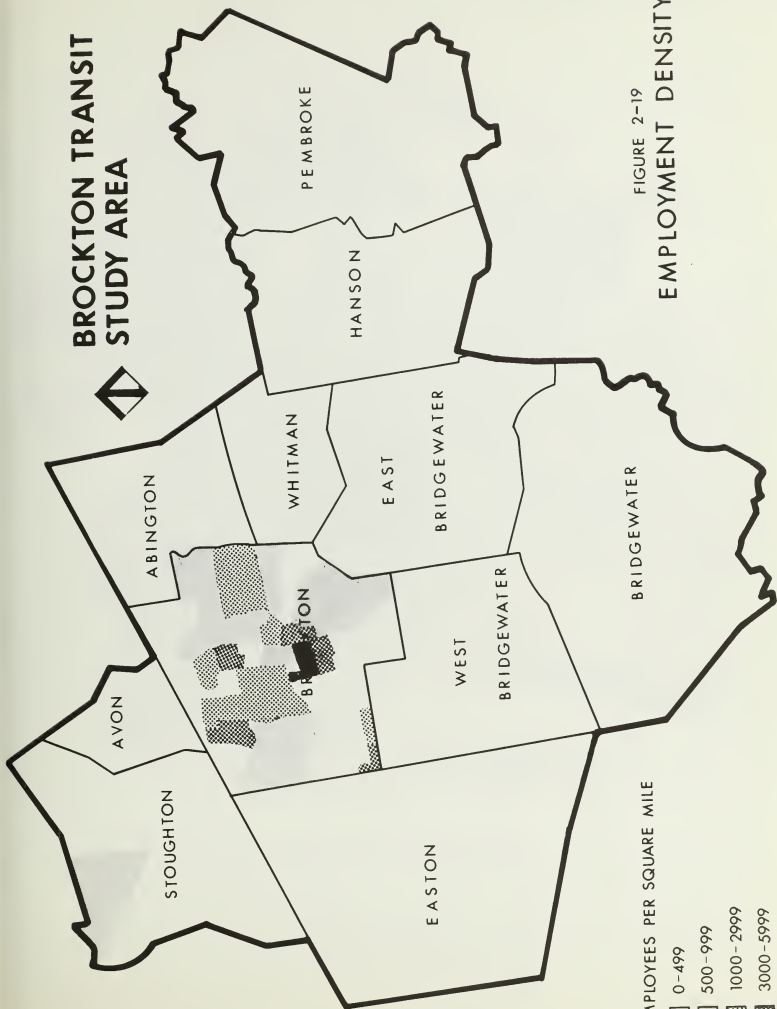


FIGURE 2-19
EMPLOYMENT DENSITY

EMPLOYEES PER SQUARE MILE

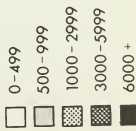
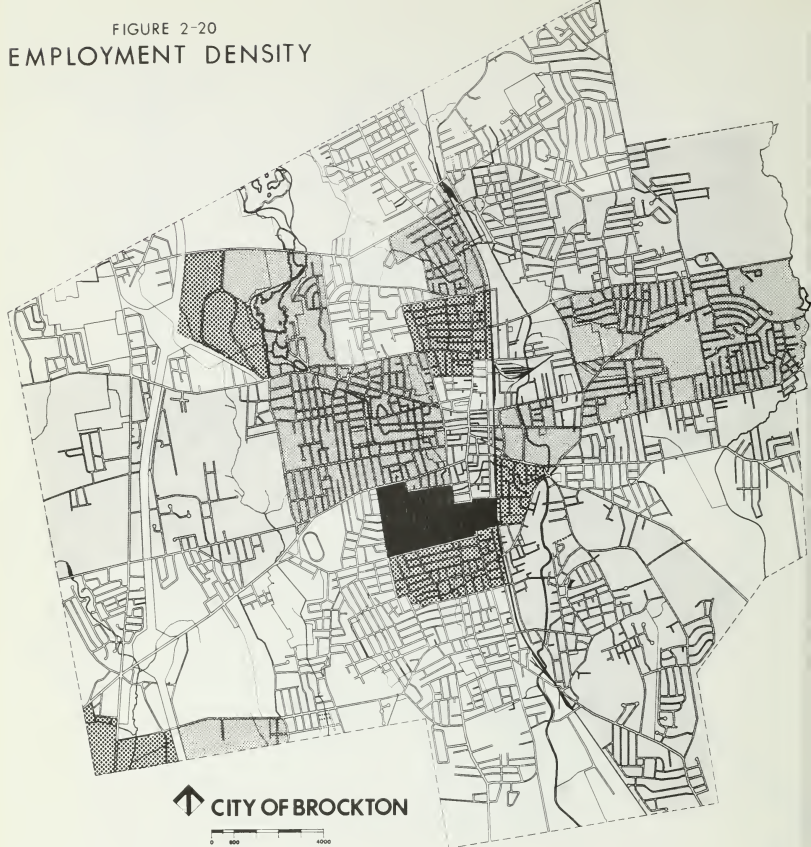


FIGURE 2-20
EMPLOYMENT DENSITY



EMPLOYEES PER SQUARE MILE

- 0-499
- 500-999
- 1000-2999
- ▨ 3000-5999
- 6000+

which point out the areas which should be served by bus at the other end of the trip.

Major Traffic Generators

Figures 2-21 and 2-22 show the location of major traffic generators within the region and the city of Brockton. These generators include major shopping facilities and employment areas. A list of generators related to these figures can be found in Appendix A.

In the development of bus routes, both the origin end of the trip (place of residence) and the destination end of the bus trip (place of employment, shopping, etc.) were considered as part of the analysis in order to point out those areas in need of bus service.

Potential Transit User Groups

A variety of surveys were conducted especially to obtain transportation needs data from the elderly, handicapped, low income, and other groups with special transportation needs. As part of the study, a sub-committee was established for all the elderly groups in operation within the region, and a similar sub-committee was formed for those groups providing services to the handicapped and those with low income. A survey was conducted of each group concerning the transportation services provided by the social agencies. A copy of the survey form is found in Appendix I. The results of present transportation service being provided can be found in Table 2-14.

This survey has shown that there is a large amount of transportation service presently provided to individuals such as the elderly and handicapped. The survey has also shown that such service could be better provided for through BAT. This is especially true for individuals who are now provided with a demand-responsive service only because they live too far from existing bus routes. Individuals who may be elderly or handicapped but are capable of walking several blocks to utilize fixed route bus service will have improved bus routings with improved frequencies.

Elderly: A special effort was made to determine the transportation needs of the elderly citizens of the region. A number of surveys were conducted and a number of types of data were analyzed. Appendix G is a copy of the survey form distributed to elderly individuals by the study staff at the elderly complexes in the Brockton area.

The study showed that 66 percent of those interviewed went shopping at least once or twice a week, and 26 percent, three to five times a week. 78 percent went shopping by bus. 45 percent made a medical trip at least once a week, and of all medical trips made, 71 percent were made by bus. This survey showed that there is a high dependence on bus service by the elderly.

Elderly population concentrations in housing complexes for the elderly and outside such housing complexes were analyzed and have been plotted in Figures 2-23 and 2-24. These figures show that the greatest concentrations of elderly requiring bus service are located in the center of the Brockton area.

As noted, Table 2-13 lists the elderly complexes and the number of units within each complex. These complexes have been located on the recommended bus

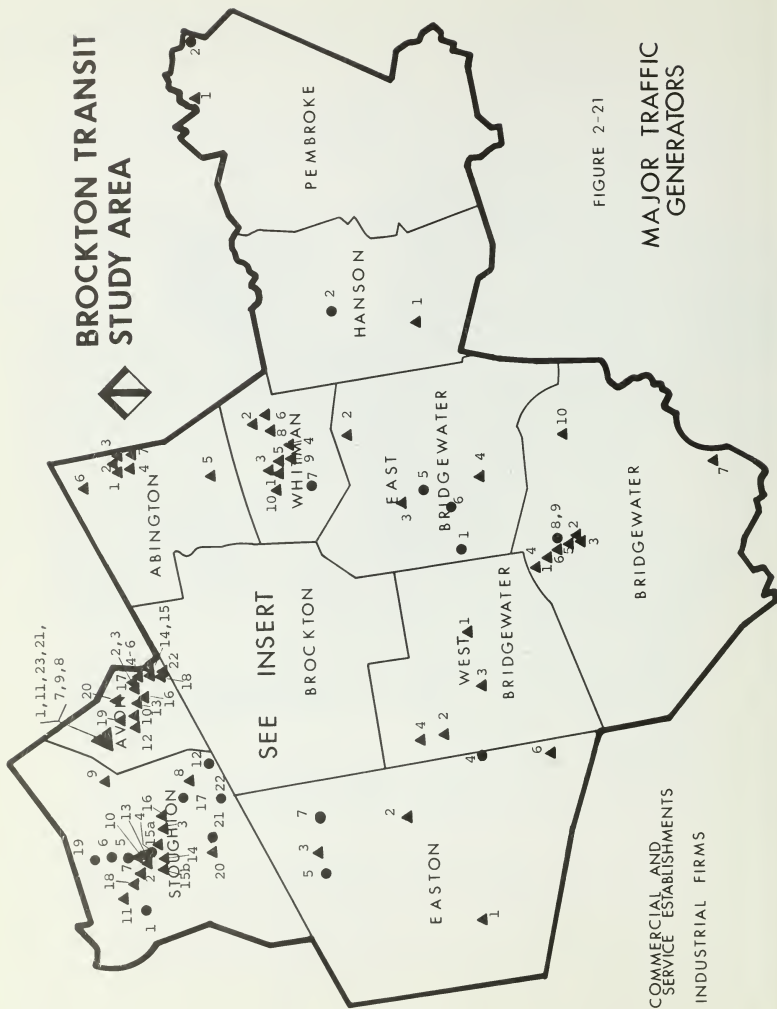
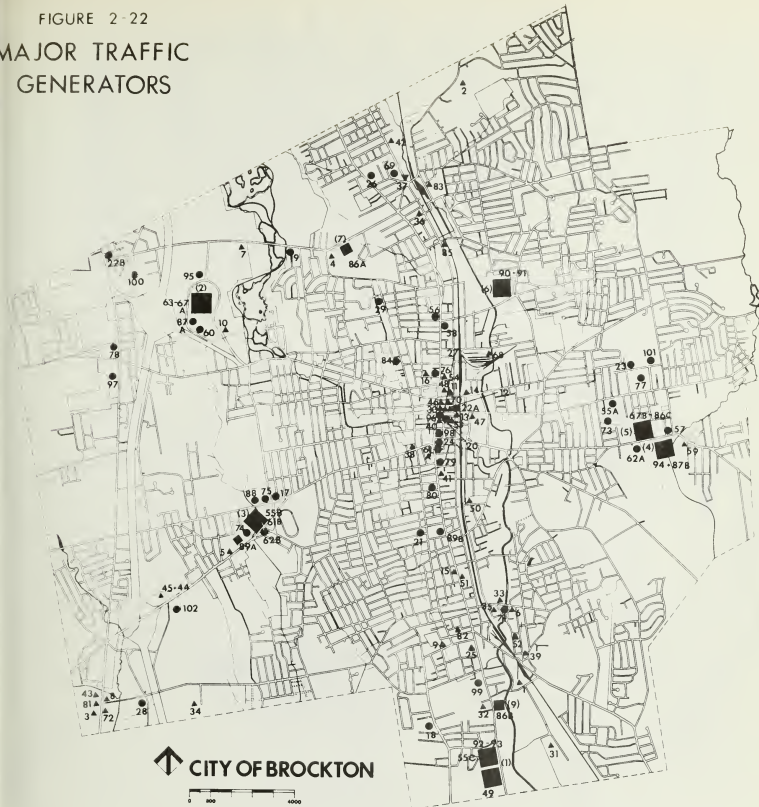


FIGURE 2-21

MAJOR TRAFFIC GENERATORS

FIGURE 2-22

MAJOR TRAFFIC GENERATORS



- COMMERCIAL AND SERVICE ESTABLISHMENTS
- ▲ INDUSTRIAL FIRMS
- SHOPPING CENTERS

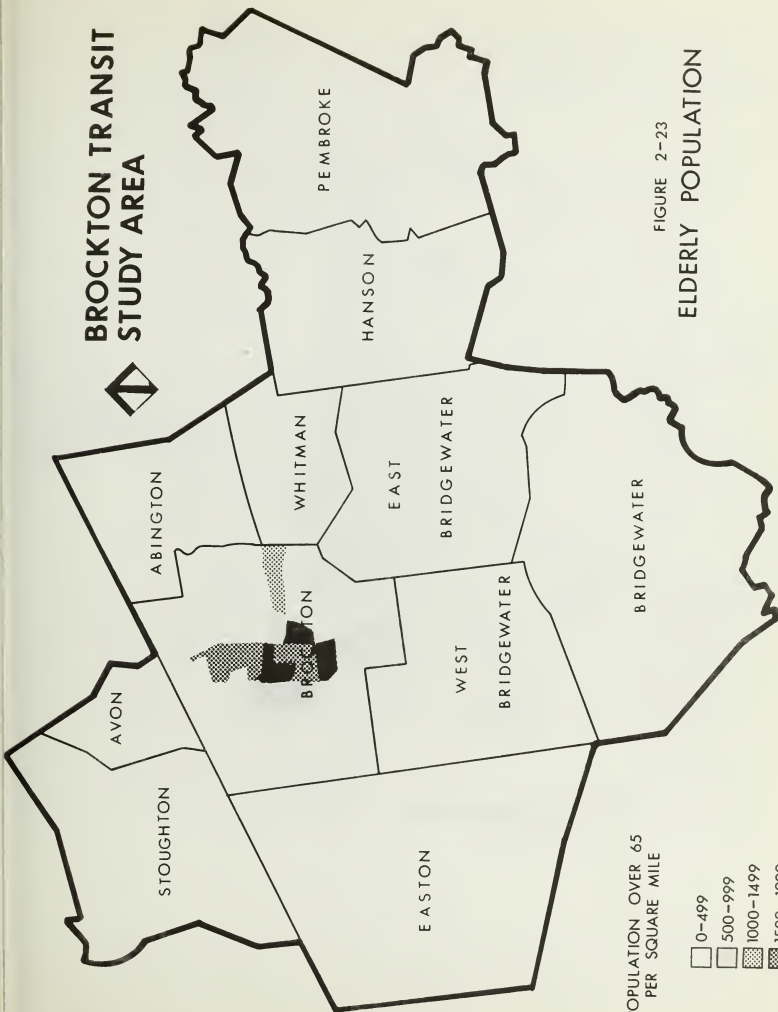
Table 2-14

Transportation for the Disadvantaged - Service Provided

Organizations Involved	Provides Transportation Service	Private Vehicles	Agency Vehicles (How Many)	Hired Vehicles	Average Number of People Served per Month	Average Saturday Trips	Provide Service To:				Type of Service Individual Group				Does Agency Meet Needs of Clients?	Source of Funds		
							Elderly	Handicapped	Low Income		Medical	Shop & Business	Recreation	Hot Lunch			Tours	
<u>Councils of Aging</u>																		
Abington	Y	Y		Y	N.A.		X			X								
Bridgewater	Y	Y		Y	200		X			X						N		
Easton		Y			50		X			X	X				X			
Stoughton				Y	500		X							X	X	N		
Brockton Board of Health	Y	Y*			20		X	X	X	X						Y		
Brockton Home Care Cent.					N.A.		X									Dept thru Inspector Allowance State Home Care Funds		
Self-Help, Incorporated	Y		9		600		X		X							Dept. of Elderly Affairs		
Spanish Center (Brockton)	Y	Y		N	N.A.											Contracts With Seven Private Interest Groups		
Old Colony Red Cross	Y		2		15		X	X	X	X						Catholic Charities Private		
State Welfare	Y			Y	110	.3		X								N		
																United Fund, Contributions		
								X								State		
Cancer Society	Y	Y			10		X	X	X	X						Y		
																American Cancer Society		

* Employees' Cars
Survey forms shown in Appendix I.

BROCKTON TRANSIT STUDY AREA



POPULATION OVER 65
PER SQUARE MILE

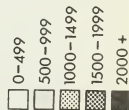
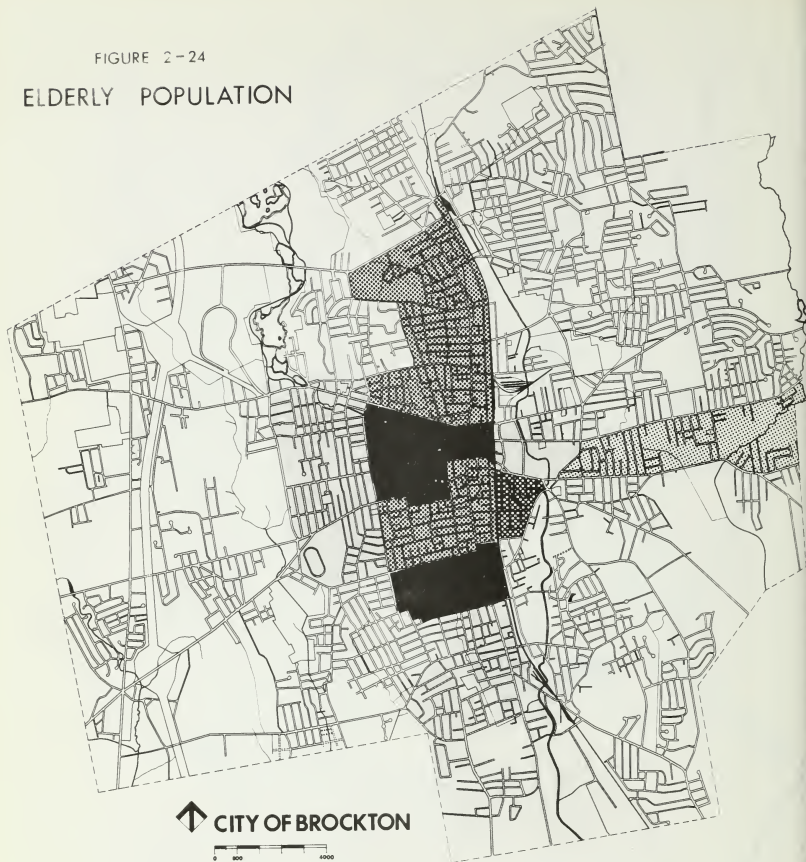


FIGURE 2-23

ELDERLY POPULATION

FIGURE 2-24

ELDERLY POPULATION



POPULATION OVER 65
PER SQUARE MILE



route maps shown in Section 4.1. During the process of conducting the study, the staff was successful in encouraging a local bus distributor to bring one of his small buses to an annual summer outing for the elderly. At that time the elderly were asked to comment on the physical features of the bus. Many people at the picnic enjoyed this opportunity and felt that the small bus met the needs of the elderly.

There are a number of elderly persons, especially those not living within walking distance of the existing facilities, or those who are handicapped who will not be able to use the fixed route service which has been recommended. For that reason, and also to serve the handicapped in the area, the Steering Committee has recommended the implementation of demand responsive bus service.

Handicapped: It is especially difficult to obtain information concerning the transportation requirements of the handicapped. As part of the attitude survey (see Appendix D) a question was asked concerning handicaps. It asked whether an individual had a handicap which prevented his driving an automobile, and whether a handicap existed which prevented the interviewee from using bus service. The expanded results for the study area indicate that a total of 3,200 persons had a handicap which restricted their bus/transit travel while a total of 5,742 were restricted as auto drivers. From these results it can be concluded that 2,542 of the area's handicapped who cannot drive, can be served by regular bus service. An additional 3,200 would require special facilities such as ramps or special buses.

To further determine the transportation needs of the handicapped, the staff met periodically with representatives of the social service agencies providing transportation services such as Self-Help, Inc., the Red Cross, and other similar agencies serving handicapped individuals.

Certainly many individuals who are handicapped can use the proposed fixed route bus service. However, there are those who cannot take advantage of bus service and to meet their needs, it is recommended that BAT sponsor demand-responsive service in each of the member communities.

Minority Groups: There was a concerted effort on the part of the staff to determine the transit needs of minority groups living in the area. Figures 2-25 and 2-26 display the percentage of the population within the analysis zones who are members of minority groups. The minority population is defined by the U.S. Census as the non-white population.

The displays show that the minority population concentration is primarily within the city of Brockton, and point out that special consideration must be given to providing service to this group. An interesting comparison can be made between this display of minority concentrations and the displays on median income statistics and population concentrations. It appears that there is a relationship between these socio-economic conditions.

Potential Transit User Areas

In an effort to develop an approach to analyzing the data previously discussed, a technique was developed for weighting the magnitude of each socio-economic condition. These weightings were then aggregated into one weighted system and potential transit usage areas were developed for the region. These areas are shown in Figures 2-27 and 2-28. A discussion of this process can be found in Staff Paper No. 7.

BROCKTON TRANSIT STUDY AREA

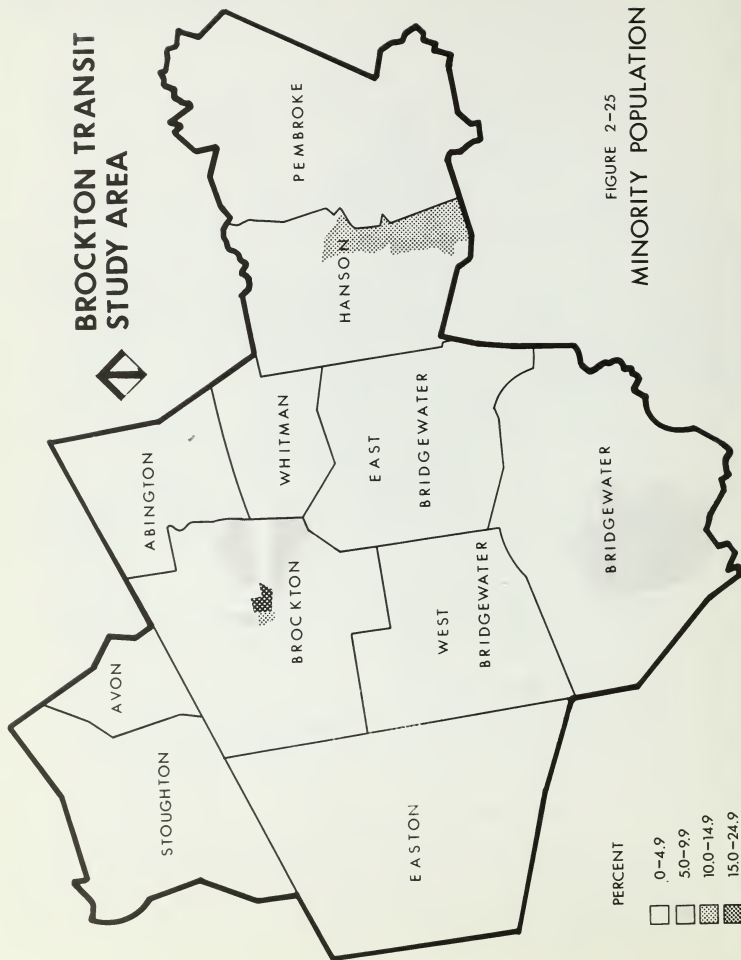


FIGURE 2-25
MINORITY POPULATION

PERCENT

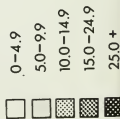
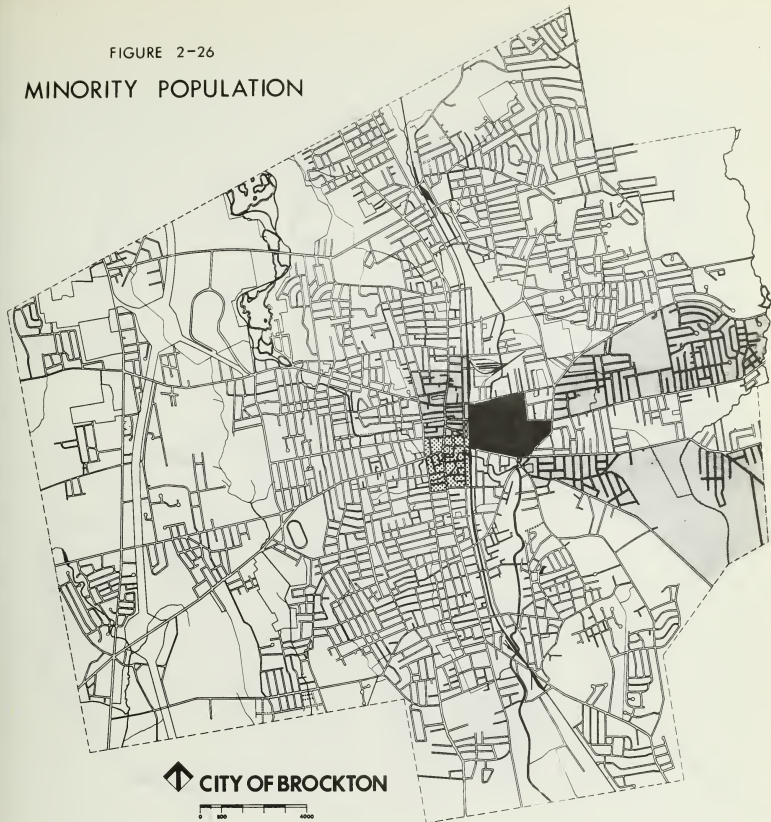


FIGURE 2-26

MINORITY POPULATION



PERCENT



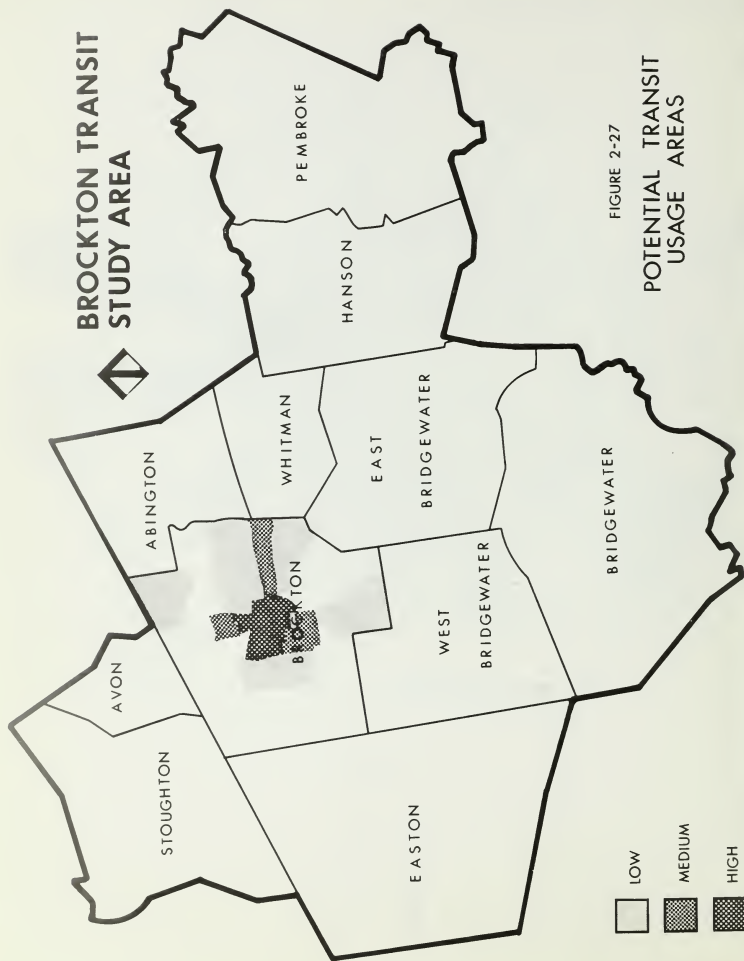
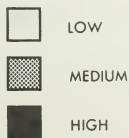
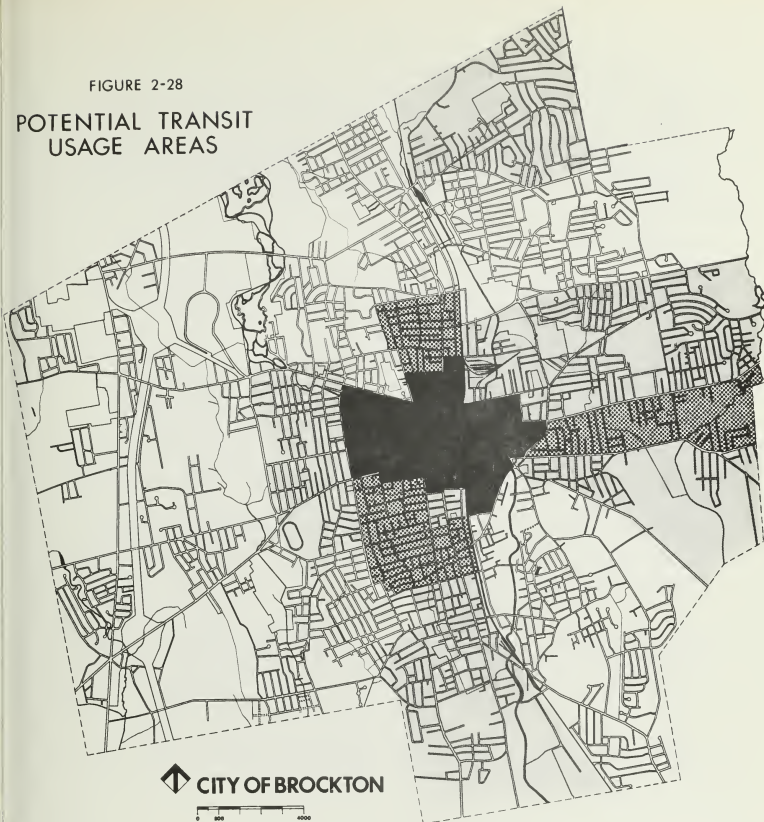


FIGURE 2-27
POTENTIAL TRANSIT
USAGE AREAS

FIGURE 2-28

POTENTIAL TRANSIT USAGE AREAS



2.6 Estimation of Transit Demand

There are basically two forms of public transportation needs in the study area. The first need is for those individuals who wish to use public transportation and are not disabled to the extent that they can walk the two or three blocks to reach a bus stop, and are capable of climbing the steps on to the bus. The second need is for those individuals who are physically disabled to the extent of being unable to use the standard fixed route service.

Present Service

There is an attempt within the area to meet both types of needs; however, they are not being met adequately at the present time. As previously discussed, fixed route service is available to some of the residents of the area. That is, those individuals who live within walking distance and are physically able, can utilize the fixed route service. Some of those individuals who are not physically capable of walking to the bus stop or climbing the bus steps are provided with service from special agencies, funded in a variety of ways. In addition, these special agencies provide to some extent, service to those physically capable clients who are not served by fixed route service. For example, these individuals might be on some sort of public assistance, and need to shop, or go to the doctor, but they are not provided with regular bus service. In addition, there are individuals in some areas who do not have fixed route service or service from the special agencies and do not have a car to use for travel.

Therefore, there is a need to improve local service in order to reach as many of those desiring public transit as possible. There are a number of ways to provide an increased level of service.

Latent Demand Survey Statistics

The Latent Demand Survey conducted asked the question, "Where would you like to take bus trips if service was available, and how often?". The data collected from the survey of a five percent sample of the residents of the area were factored to all dwelling units by town, then factored to the average daily trips. From the results of this survey, it is obvious that many people would like to use bus service if it was available on an effective and efficient basis. In addition, it is rather clear that many interviewees were quick to answer questions concerning the need for bus service, but it is questionable whether they would use the service if it was available. The survey developed the following statistics:

Table 2-15

Average Daily Bus Trips in Region

	<u>Number</u>	<u>Percent</u>
Work Trips	25,500	69.1
Non-Work Trips	<u>11,400</u>	<u>30.9</u>
All Trips	36,900	100.0

About one-third of the people wishing to improve bus service would like to make a short bus trip within the same Basic Analysis Zone in which they live.

Latent Demand Trip Tables: The data collected from the Latent Demand Survey contained the origin and the destination of the desired bus trips. These trips were accumulated into latent demand trip tables to show the desired major movements for improved bus service. Table 2-16 shows the average daily bus trip desires for all purposes. In addition, it shows the desire to make approximately 17,000 daily bus trips to areas outside the study area (labeled "Externals"), or a total of about 20,000 daily bus trips for all purposes within the region, the majority of the trips being within Brockton itself. Table 2-17 shows the desired bus trip interchanges for work trips. This table shows a total of approximately 25,000 daily bus trips, slightly over 14,000 of which are to destinations outside the Brockton area.

These two trip tables present some interesting statistics. For example, the first table, Table 2-16, shows a desire to make 10,000 daily bus trips within the city of Brockton, or an increase of five times the bus utilization in 1974. There is no question that the Latent Demand Survey tends to inflate the actual demand for service in that some individuals fill out the form and will not really use the service, while others assume that the service will be improved beyond a reasonable level.

Trip End Concentrations: The Latent Demand Survey data developed were analyzed to determine the desire to make bus trips into and out of certain zones within the region. Figures 2-29 and 2-30 show the latent demand for average daily trips into zones, and are displayed according to latent demand trip densities. Figures 2-31 and 2-32 show the latent demand bus trips leaving zones for the study area. This set of figures showing the desire to make bus trips into and out of zones aids in displaying those areas which probably should be provided with improved bus service.

Figure 2-33 is a display of latent demand average daily trips for all purposes between municipalities. The display shows that the desire to make bus trips is primarily into the city of Brockton, and that the interchange of latent demand bus trips between surrounding towns is very minimal.

Journey-to-Work Data

The Journey-to-Work data collected by the U.S. Census in 1970 was provided by the Massachusetts Department of Public Works. Table 2-18 summarizes these data. The statistics show that bus work trips are two percent of all work trips.

Table 2-18

Brockton Urban Area Journey-to-Work Data

<u>Work Trips By</u>	<u>To All Places</u>	<u>Within Urban Area</u>	<u>To Brockton</u>
<u>All Modes</u>			
All Urban Area Residents	73,349	21,195	16,327
Brockton Residents	34,892	15,558	12,620
<u>Bus Trips</u>			
All Urban Area Residents	1,411	594	573
Brockton Residents	910	519	520

Table 2-16

Latent Demand Trip Table

All Trips - Daily

From \ To	Abington	Avon	Bridgewater	Brockton	E. Bridgewater	Easton	Hanson	Pembroke	W. Bridgewater	Whitman	Stoughton	Externals	Totals
Abington	38	96		423						38	58	1193	1846
Avon		102		204							20	489	815
Bridgewater			1013	803					80		161	772	2829
Brockton	48	290		10045		403			161	48	32	5820	16847
E. Bridgewater				468	97				97	81	81	387	1211
Easton				421		204						963	1588
Hanson			74	147				44				869	1134
Pembroke	130			182								3114	3426
W. Bridgewater			211	591		70			141			310	1323
Whitman				94	283					320		1356	2053
Stoughton		86		1123							475	2161	3845
Externals													
Totals	216	574	1298	14501	380	677	0	44	479	487	827	17434	36917

Table 2-17

Latent Demand Trip Table

Work Trips - Daily

From \ To	Abington	Avon	Bridgewater	Brockton	E. Bridgewater	Easton	Hanson	Pembroke	W. Bridgewater	Whitman	Stoughton	Externals	Totals
Abington	38	96		327								885	1346
Avon		102		163								407	672
Bridgewater			161	386					80		161	579	1367
Brockton		242		5739		242			81		32	4465	10801
E. Bridgewater				290	81				97	81	81	339	969
Easton				312		54						827	1193
Hanson				44								559	603
Pembroke	130			130								3011	3271
W. Bridgewater			141	465					70			296	972
Whitman				38	283					283		1149	1753
Stoughton		86		367							108	1966	2527
Externals													
Totals	168	526	302	8261	364	296	0	0	328	364	382	14483	25474

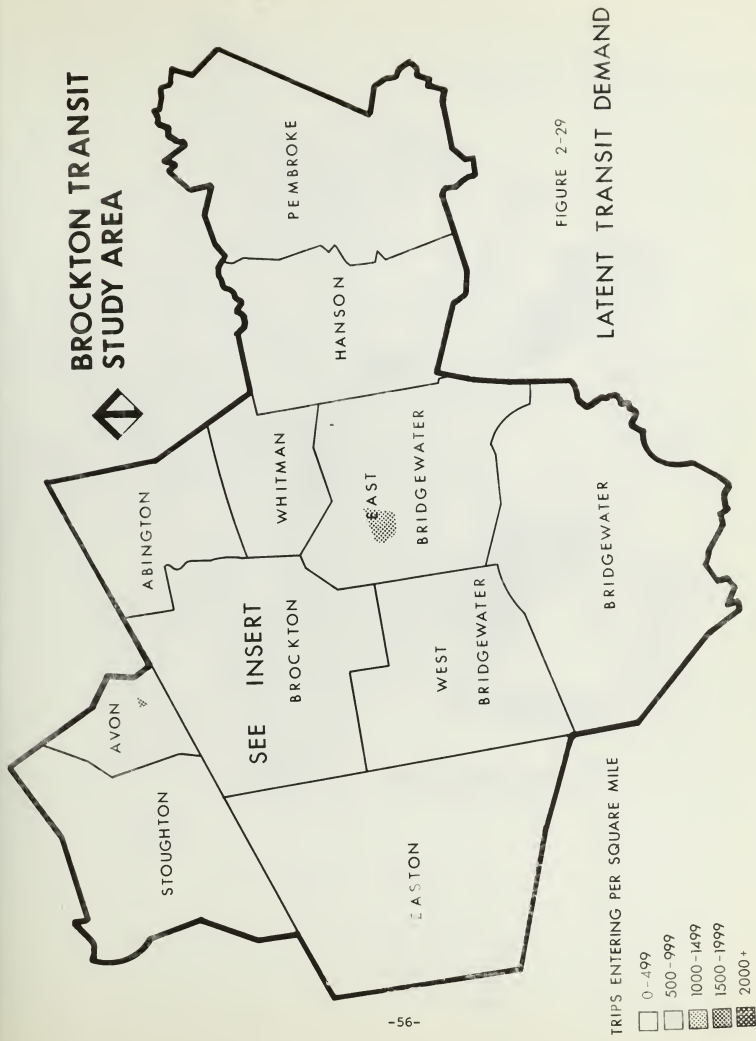
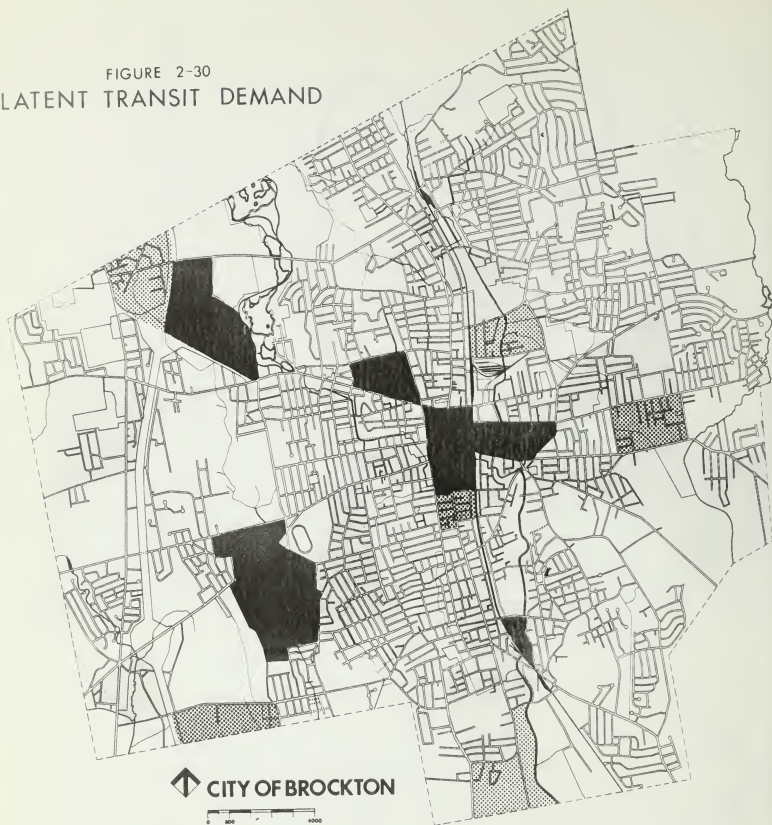


FIGURE 2-29

LATENT TRANSIT DEMAND

FIGURE 2-30
LATENT TRANSIT DEMAND



TRIPS ENTERING PER SQUARE MILE



BROCKTON TRANSIT STUDY AREA

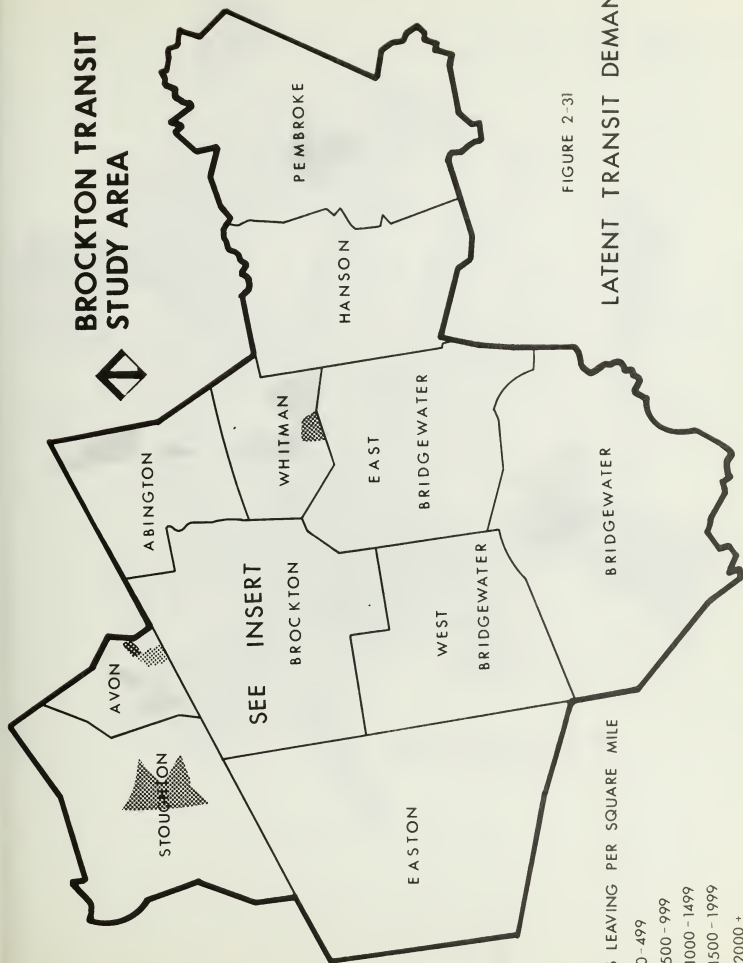


FIGURE 2-31

LATENT TRANSIT DEMAND

TRIPS LEAVING PER SQUARE MILE

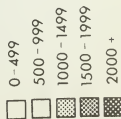
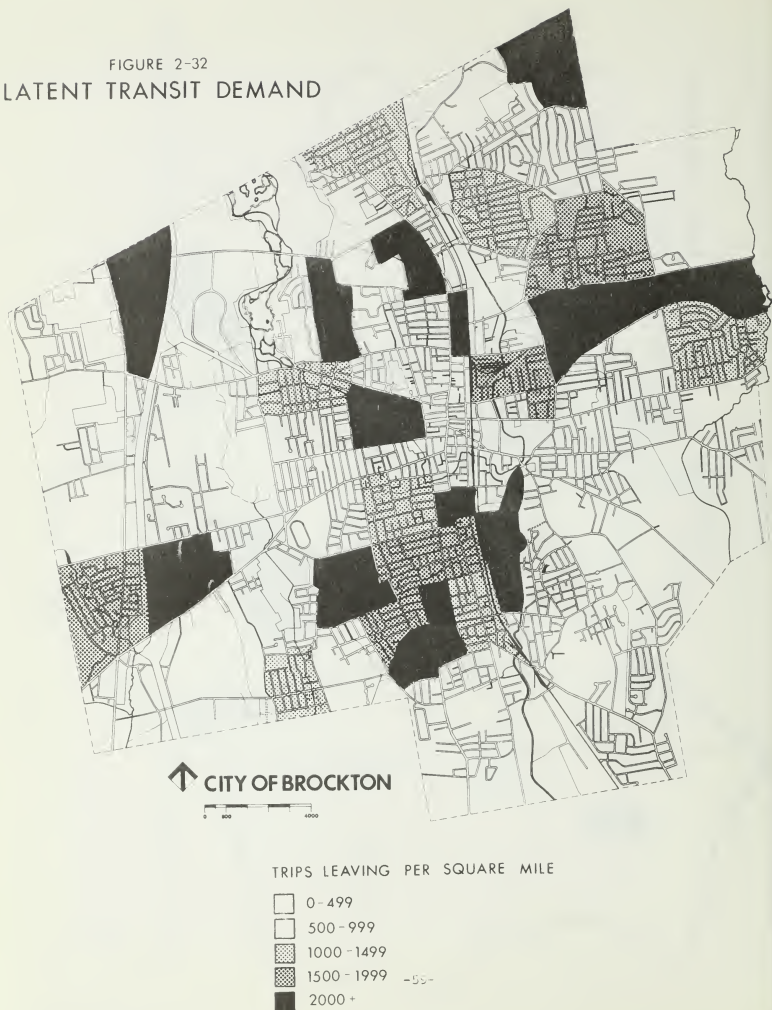


FIGURE 2-32
LATENT TRANSIT DEMAND



BROCKTON TRANSIT STUDY AREA

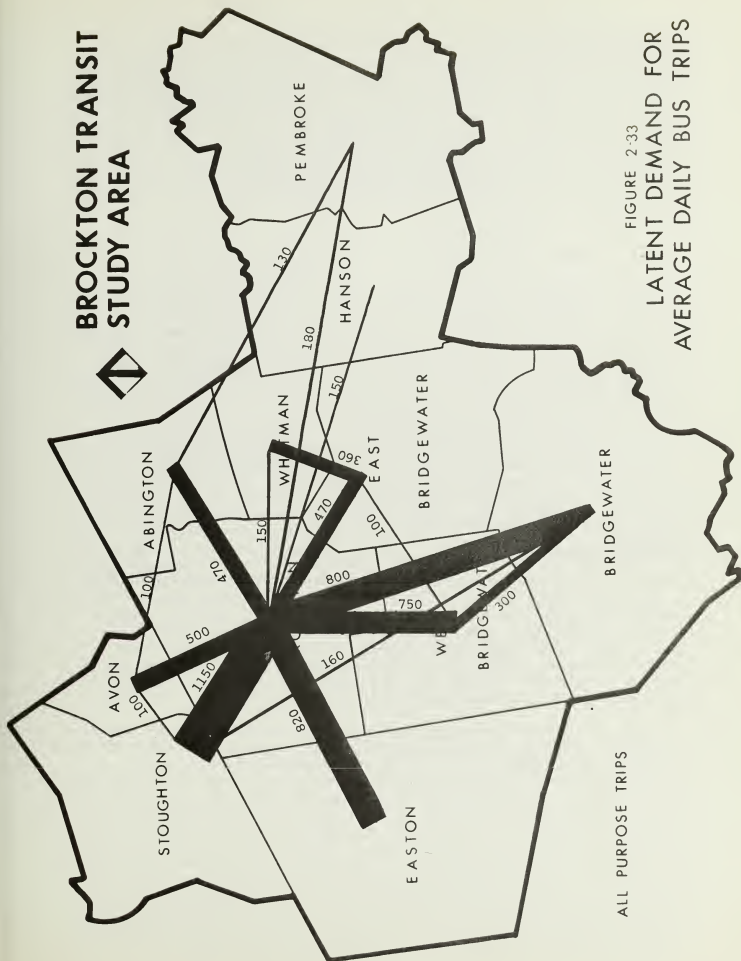


FIGURE 2-33
LATENT DEMAND FOR
AVERAGE DAILY BUS TRIPS

Bus Work Trips in 1970

The 1970 U.S. Census collected statistics concerning the population's journey-to-work mode of travel and place of work. At the time of the census (April, 1970), about 69,500 Brockton residents out of 89,500, or about 78 percent, lived within a quarter-mile of local bus routes, and were therefore served by bus transit. In addition, during the census, 34,900 workers lived in Brockton and worked throughout the area, including Brockton. Of those 34,900 workers, 910 or 2.6 percent traveled to work by bus. Of the 12,600 workers living and working within the city, 520 or 4.1 percent traveled to work by bus.

Trips Per Family

The Home Interview Survey previously discussed in this report collected statistics concerning trip generation. From the survey it was concluded that the average Brockton area family made 7.8 trips on the average week day for all modes excluding walk, bicycle, and school bus trips, and that the average family made 5.9 auto driver trips on the average day. This statistic is similar to trip generation statistics developed from surveys in other comparable areas. In this case, the trip was defined as the movement from an origin to a destination and was not defined as a round trip, that is, from an origin to a destination and back to the origin. The 5.9 auto driver trips per family multiplied by the number of families in the study area results in a total of 347,000 daily one-way trips generated by residents of the study area. This is a rather substantial number of trips, especially when compared to the 3733 average daily bus trips made within the region. In other words, approximately one percent of all trips made within the area are made by bus.

Estimating Ridership

There is no foolproof absolute method for predicting transit ridership on an improved transit system. Transit ridership is dependent upon a large number of variables including the dependability of the service, the promotion of the service, the hours the service runs, the bus routes, frequencies, and other variables. However, it is necessary in this type of study, to make an estimate of ridership by route so that estimates can be made of the revenue, the bus size, the amount of subsidy required, and to determine whether the improvements are, in fact, economically feasible.

A number of investigations were made to address the estimating of transit ridership. The Latent Demand Survey was useful in helping to detail future corridors and to develop estimates of bus ridership by small areas. In addition, the On Board Bus Survey and the analysis of existing service were used to develop passenger productivity rates for existing service so that present ridership could be compared to ridership of past surveys and to the ridership of systems in other cities of similar size to the Brockton area. Passenger productivity is defined as the number of revenue passengers using bus service on the average day for a particular route divided by the revenue bus miles of service provided on that route for the day. The surveys conducted for the area obtained productivity rates varying from .4 on the Brockton-Rockland run to 3.1 on the Campello route. Some of these productivities are extremely low and steps should be taken to improve and promote service so that the productivity is substantially increased. For a number

of studies which have been made throughout the country, productivity has ranged from 2 to 4 passengers per revenue mile with a reasonable productivity being 2.5 to 3.0. Table 2-19 shows the productivity of the various routes in the Brockton area.

Table 2-19

Productivity of Local Routes
(passengers per revenue bus mile)

<u>Route</u>	<u>On Board Survey</u>
<u>Crocker Transportation</u>	<u>February, 1974</u>
Montello-Campello	3.1
Centre-Crescent	1.5
Pleasant-Belmont	2.5
Perkins-Ames	0.5
Copeland-Ashland	0.5
Brockton-Rockland	0.4
Senior Citizen	<u>4.2</u>
Average	1.5
<u>Interstate Coach</u>	<u>October, 1974</u>
Easton-Brockton	0.5
Stoughton-Brockton	0.8
Average	0.7

Based on the socio-economic statistics compiled for the region, the elderly and handicapped surveys, and the Latent Demand Survey, ridership estimates were made for each bus route in the area. These estimates were used to develop and test a variety of alternative transit plans which are discussed in more detail in a following section.

2.7 Attitudes Regarding Transit Service and Operation

The Latent Demand Survey conducted in August, September, and October, 1974 of five percent of the families in the region was also used to obtain certain attitudes toward present transit service and to obtain some idea of the type of service area residents would like to see. The survey form used can be found in Appendix D. Especially interesting were the questions used for rating a number of items that respondents would like to see improved in bus service. The responses to these items have been graphed and displayed in Figure 2-34. It is interesting to note in this figure that the desire for cleaner buses is very high, and that more service in the rush hours has a high rating. The desire for an increase in rush hour service indicates that more individuals in the area would prefer to use the service to and from work and do not find the present service adequate. Also important is the fact that area residents are not all that concerned with door-to-door (demand-responsive) service, nor with air conditioned buses.

From the Home Interview Survey, conducted as part of this study, the interviewees were asked to comment on the existing bus service. 105 interviewees did comment, and Table 2-20 shows the comments by major category. The vast majority of those commenting felt strongly about the need to improve the bus scheduling and frequency. Most people felt that the buses did not come often enough or at appropriate times.

Table 2-21 shows partial results of the Latent Demand Survey.

Table 2-20

Summary of Home Interview Survey Comments

<u>Comment</u>	<u>Number</u>	<u>Percent</u>
<u>Bus Service</u>		
1. Improved Schedules and Frequency	45	42.8
2. Improved Bus Routing	6	5.7
3. Desire Smaller Buses	1	1.0
4. Improved Bus Service to Boston	8	7.6
Improved Rolling Stock	2	1.9
5. Improved School Bus Service	6	5.7
6. Satisfied with Present Service	4	3.8
7. Special Buses to Serve Elderly	5	4.8
<u>Train Service</u>		
1. Improved Train Service	14	13.3
<u>General Comments</u>		
1. Improve Downtown Traffic and Parking	7	6.7
2. Would Rather Use Auto	7	6.7
	105	100.0

Table 2-21

Partial Results of Latent Demand Survey

9. If bus/transit service were improved so that it would be possible to catch a bus/transit at least every fifteen minutes, and walking distances to bus/transit stops were five minutes or less, would members of your household use the bus/transit more often?

Yes	379	60%
No	<u>254</u>	40%
	630	

11. How do you rate existing bus service?

Good	40	6%
Fair	108	16%
Poor	214	32%
No Opinion	151	23%
Not Available	<u>150</u>	23%
	663	

12. What agency should be responsible for the operations of transit service?

Private Bus Companies	224	35%
State	26	4%
Combination State/Town	115	18%
Transit Authority	130	20%
No Opinion	<u>144</u>	23%
	639	

13. Would you tolerate a small increase in local property tax to help support bus transit operations?

Yes	109	17%
No	437	67%
Don't Know	<u>105</u>	16%
	651	

Table 2-21 (con't)

14. How many members of your household have a handicap which restricts their travel as an:

Auto Driver 66 persons

Bus/transit Passenger 37 persons

15. With regard to bus/transit service, how important do you rate each of the following factors?

	<u>Very Important</u> 18%	<u>Fairly Important</u> 53%	<u>Not Important</u> 29%
a. New Buses			
b. Benches at most bus stops	30%	32%	38%
c. New Bus Stop Signs	45%	32%	23%
d. More frequent service			
Rush hour	78%	15%	7%
Mid-day	25%	53%	22%
Evening	35%	44%	21%
Weekday	26%	45%	29%
e. Passenger shelters at major stops	41%	39%	20%
f. Air-conditioned buses	21%	34%	45%
g. A bus transit information service	57%	32%	11%
h. Cleaner buses	56%	38%	6%
i. Lower fares	15%	42%	13%
j. Door to door service	11%	31%	58%

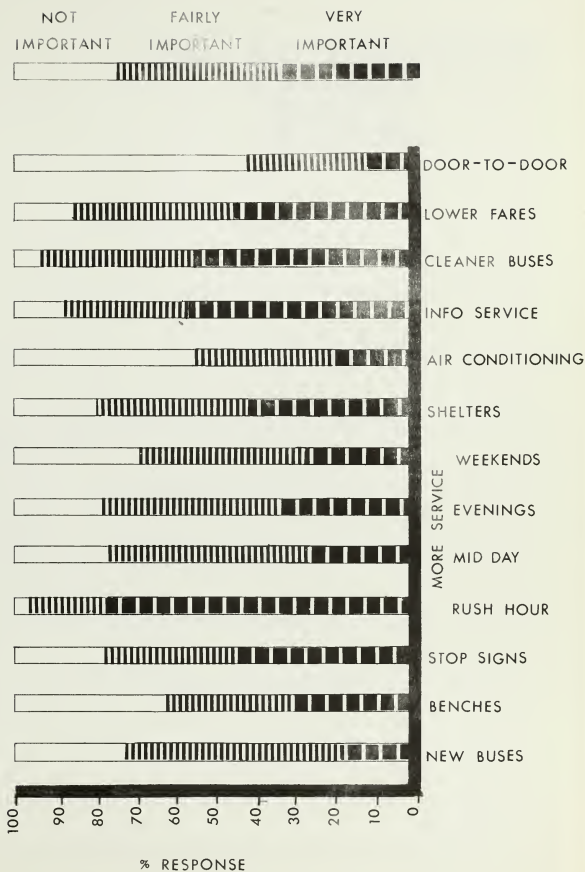
16. Please indicate your family's annual income:

\$0-4,999 5%

\$5,000 - 9,999 19%

\$10,000 or over 76%

FIGURE 2-34
ATTITUDE TOWARDS BUS IMPROVEMENTS
LATENT DEMAND SURVEY





3.0 ALTERNATIVE TRANSIT SYSTEMS



3.0 ALTERNATIVE TRANSIT SYSTEMS

3.1 The Alternatives

In conducting a detailed bus study of this type, it is necessary to investigate a variety of alternative service improvements not only to convince the staff and the sponsoring agency that the system being recommended is the most appropriate, but also to satisfy the questions of the public. There will always be an element of the public which will suggest that the demand-responsive type of service far exceeds the service that can be provided by fixed route. Therefore, the analysis must assure the public that the system recommended is the most appropriate.

Bus Service Objectives

In the process of developing alternatives, the staff has considered a number of objectives and used them in the analysis process. Following are the objectives developed:

1. To provide economical bus service to as many people as possible within the study area (economical service is defined as a service carrying as many riders as possible for a given number of revenue miles).
2. To provide bus service to as many elderly, handicapped, and disadvantaged individuals as possible.
3. To provide service to the elderly and handicapped at a reduced fare.

It is difficult, if not impossible, to objectively determine a level of service that is economically efficient. One way of reaching the bus service objectives in the area is to determine the amount of local funds available for the operation in terms of annual subsidy and expand that subsidy to include state and federal funds. Alternatives can then be developed on that level of funding. The alternative encouraging the greatest number of riders could be considered that alternative most economically efficient. One might wish to further stratify that ranking by considering the number of disadvantaged accommodated by each alternative. The above objectives were considered in the analysis of the alternatives included in the study.

Development of Alternative Plans

The city of Brockton had an estimated 1974 population of 98,640 and an area of 21.37 square miles, resulting in a population density of 4,616 persons per square mile. The communities surrounding Brockton: Avon, Abington, East Bridgewater, Easton, Stoughton, West Bridgewater, and Whitman, had a total estimated 1974 population of 95,135, an area of 98.81 square miles, and a population density of 963 persons per square mile. Neither the city of Brockton nor the adjoining towns have a population density great enough to justify any public transportation mode other than bus service. Therefore, the study of alternative systems has disqualified fixed rail service which can be defined to include trolley service, monorail, subway, deep tube, and personalized rapid rail transit.

The development of alternatives has, in many cases, used two different classi-

fications of fixed routes which are called "primary" and "secondary" routes. The "primary" routes are those running through the higher density corridors, carrying a larger number of passengers, and running more frequently than the "secondary" routes.

The staff developed three major alternatives and a number of minor ones within the major groups. The major alternatives considered are:

- A. Improved present service
- B. Total demand-responsive service
- C. Fixed route-circumferential route service

The following is a discussion of each major alternative and sub-alternative. The assumptions used when analyzing each alternative include:

- Service provided for a 14-hour period on weekdays; Saturday service is approximately 50 percent of average weekday service.
- Capital improvements are the same for all alternatives. The analysis assumes designated stops are used and that all buses are equipped with lock boxes.
- The average fare in all alternatives is 20¢ in Brockton and 30¢ in the towns. The radial fixed route service assumed an alternative route destination system.
- Service assumes free transfers.

A sketch map and a description of each alternative is found in this section. In the course of analyzing the alternatives, it became clear that the towns surrounding Brockton require fixed route service from the center of town to Brockton, regardless of the alternative being analyzed for the city of Brockton. The fixed route service for the surrounding towns is discussed later in this section.

Alternatives

- 1. Radial Fixed Route (similar to present service)
 - 1A Present Service
 - 1B Expanded Service
 - 1C Expanded Service and Demand-Responsive
- 2. Complete Demand-Responsive Service
- 3. Circumferential-Radial System
 - 3A Total Fixed Route
 - 3B Fixed Route with Limited Deviation
 - 3C Demand-Responsive Circumferential
 - 3D Fixed Route Circumferential Peak/Demand-Responsive Off Peak
 - 3E Fixed Route Peak/Fixed Primary and Demand-Responsive Off Peak

1A Radial Fixed Routes - Present Service Level: This major alternative is basically the fixed route fixed schedule service which presently exists. This alternative retains for the most part the present routing and schedule, and requires the replacement of rolling stock and the application of an information system and concentrated promotional program. This alternative will require nine vehicles and is illustrated in Figure 3-1.

FIGURE 3-1

1A - RADIAL FIXED ROUTE - Present Level of Service



Radial Fixed Routes - Expanded Service: In this alternative, many of the existing bus routes would be changed to make service more effective. In addition to investigating a number of smaller changes in the routing such as changes in the streets traveled, one major change has been investigated, and that is "Alternating Route Destinations". For example, Campello and Montello have been one continuous route through the center of Brockton. The surveys conducted as part of the study and the data available from the Census Journey-to-Work all point out that there are no major crosstown corridors in Brockton. Present bus ridership and the desired bus trips are spread out across the city with only downtown (Main and School Streets) as a major rider destination. Riders get on at Campello, get off at Main and School Streets, and transfer to other routes going all over the city.

The purpose of the "Alternative Route Destination" routing is to provide the public with a variety of routings from any location, and therefore reduce the number of transfers, which will encourage more people to use the service. This alternative is basically a doubling of service (bus miles and hours of operation), and is illustrated in Figure 3-2.

FIGURE 3-2

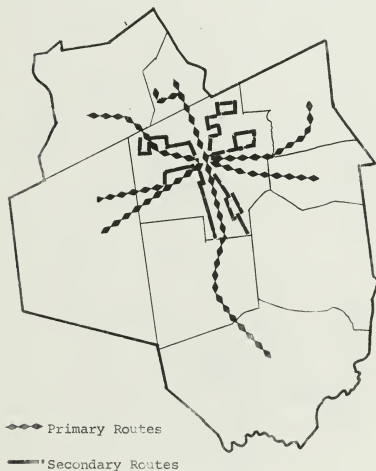
1B - RADIAL FIXED ROUTE - Expanded Level of Service



1C Radial Fixed Route - Expanded Service and Demand-Responsive. The fixed route portion of this alternative is similar to Alternative 1B except that an effort was made to reach a greater portion of the population. This included adding large loops to the routing which were minimized in Alternative 1B. There was also some discussion of complementing the fixed route service with demand-responsive service.

FIGURE 3-3

1C - RADIAL FIXED ROUTE - Expanded Level of Service



4. Totally Demand-Responsive System: This alternative is a total demand-responsive service which allows an individual to call a dispatcher to request service at his door and be dropped off at his destination within the city of Brockton. The trip would be routed in a way which would carry as many people as possible together in one vehicle, thus reducing operating costs. The service would be accompanied by a promotional program and the informational system would be closely tied into the dispatching service.

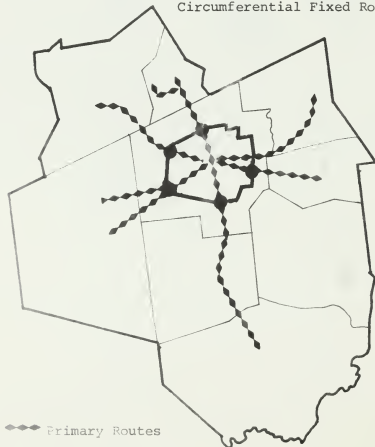
Because of the high density of trip ends along the existing routes which could not be accommodated by a demand-responsive system, the staff considered this alternative unrealistic. The conclusion was that there is a definite need for fixed route service and that demand-responsive service would not be able to satisfy the peak demand without requiring an excessive ly large number of vehicles and a consequent high cost.

3A Total Fixed Route, Circumferential: This alternative considered radial fixed route service out of the downtown area on the six primary radial routes, and circumferential routes between five neighborhood terminals. This system would require an extra transfer to travel from one part of the city to another. Since radial service is limited to the primary routes, the individual would have to use the circumferential route to reach a neighborhood terminal where he could transfer to a fixed route. He would probably make a second transfer in the downtown area to a radial route in the desired direction of travel, and possibly another transfer at a neighborhood terminal to a circumferential route. Figure 3-4 is a display of this alternative.

FIGURE 3-4

3A - RADIAL FIXED ROUTE

Circumferential Fixed Route

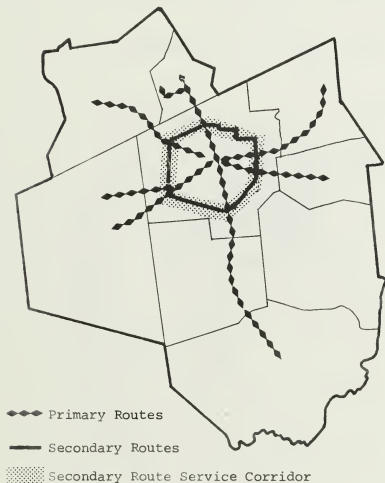


- ◆ Primary Routes
- Secondary Routes
- Neighborhood Terminals

3B - Fixed Route Circumferential with Limited Deviation: This alternative is very similar to Alternative 3A except that the circumferential route vehicles would be allowed to travel three or four blocks off the route to drop off passengers, but would pick up people only on the fixed circumferential route. This alternative was felt to be difficult to operate because buses would not be able to keep to schedule. Figure 3-5 is a display of this alternative.

FIGURE 3-5

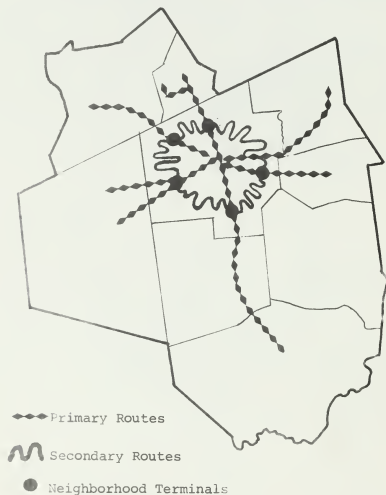
3B - FIXED ROUTE CIRCUMFERENTIAL - Limited Deviations



3C Demand-Responsive Circumferential: This alternative utilizes fixed route service on the six primary routes, and demand-responsive service in the sectors between the primary routes. Therefore, a potential passenger living too far from the fixed route service would call for demand-responsive service to pick him up and drop him along a fixed route so that he could then travel into Main and School Streets to transfer to a route for his final destination. It was believed that this service would be too expensive to provide and would not work during the peak periods because ridership would be concentrated in corridors, therefore justifying radial fixed route service for all buses. Figure 3-6 is a display of this alternative.

FIGURE 3-6

3C - DEMAND-RESPONSIVE CIRCUMFERENTIAL

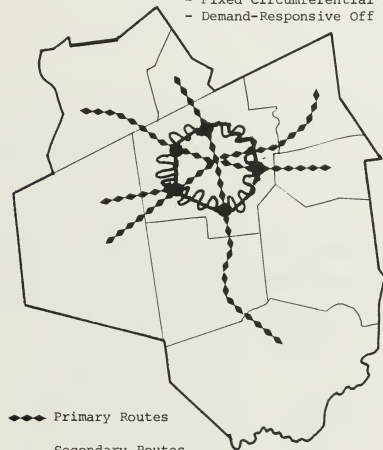


3D Fixed Route Circumferential Peak/Demand-Responsive Off Peak: This alternative was a combination of Alternatives 3A (Total Fixed Route Circumferential) and 3C (Demand-Responsive Circumferential). As the analysis was made, this alternative was considered too costly and not capable of meeting the urban bus demands existing in the area. Figure 3-7 illustrates this alternative.

FIGURE 3-7

3D - RADIAL FIXED ROUTE (Combination of 3A & 3C)

- Fixed Circumferential Peak
- Demand-Responsive Off Peak



- ◆◆◆ Primary Routes
- 〰 Secondary Routes Off Peak
- Secondary Routes Peak
- Neighborhood Terminals

Alternative 3E is a combination of Alternative 1C (Expanded Service) and Alternative 3C (Demand-Responsive Circumferential). This alternative suggests both primary and secondary fixed route fixed schedule service into the downtown area in the peak periods and fixed route service on the six primary routes in the off peak periods with demand-responsive service in the off peaks for the secondary route corridors. While attractive in terms of coverage, this alternative does not have the simplicity of a completely fixed route system and may be too confusing for patrons. It is recommended that experimentation with demand-responsive service within sectors be made as the system develops. Figure 3-8 illustrates this alternative.

FIGURE 3-8

3E - RADIAL FIXED ROUTE/DEMAND RESPONSIVE

Peak - Fixed Route (all routes)

Off Peak - Fixed Route Primaries

* Demand Responsive



3.2 Analysis of Alternatives

An estimate of ridership was made for each alternative, based on the proportion of population served, the level of service provided and an estimate of ridership per revenue bus mile. At a meeting of the study Steering Committee, each alternative was discussed and analyzed and the committee dropped some of the alternatives from further analysis, added an alternative, and requested more detailed information to study the other alternatives. Table 3-1 is a comparison of the various alternatives, using a number of judgement areas which cannot be easily weighed quantitatively. Appendix L which is a table from Staff Paper No. 5 "Analysis of Alternative Plans" documents the costs for providing the service in each alternative and a variety of other statistics.

Table 3-1

Comparison of Alternatives

	1A	1B	1C	3A	3C	3D	3E
1 Ease in Maintaining Schedule	Good	Good	Good	Good	Fair	Fair	Fair
2 Public's Accessibility to Bus Service	Poor	Good	Good	Fair	Good	Good	Good
3 Ridership per Revenue Mile	Good	Good	Fair	Poor	Fair	Poor	Fair
4 Ease in Promoting Service	Good	Good	Good	Fair	Fair	Fair	Fair
5 Ability to meet City's Development Goals	Fair	Good	Good	Fair	Fair	Fair	Good
Estimated Total Deficit (\$000's)	\$253	\$867	\$872	\$1,122	\$1,081	\$1,107	\$994
Estimated Deficit per Rider	\$0.25	\$0.49	\$0.50	\$0.69	\$0.59	\$0.65	\$0.56

Population Served by Alternatives

As part of the analysis, the staff calculated the portion of the population living within one-quarter of a mile of bus service for each of the proposed alternatives. These statistics were developed by tabulating adjusted U.S. Census block statistics for the half mile belts covered by each route. The following table shows that data.

Table 3-2

Brockton Population Accessible to Bus Service

<u>Alternative</u>	<u>Population Served</u>	<u>Percent of 1970 Population</u>
1B	75,200	84
1C	80,000	90
2 Demand Responsive	89,040	100 ¹
3A	55,000	62
3B Demand Responsive	89,040	100
3C Demand Responsive	89,040	100
3D Demand Responsive	89,040	100
3E Demand Responsive	89,040	100
Primary Routes	37,200	42
Montello, Campello, Centre, Crescent, Belmont, Pleasant		

1 Demand-Responsive service in these alternatives will serve all BAT-area residents.

System for Suburban Towns

After substantial analysis of possible alternatives in the study area including alternatives in the suburbs, it was decided that the primary service to suburban towns should be fixed routes radiating out of Brockton with demand-responsive service if the town wishes to support it. Table 3-3 is a summary of bus service for the towns surrounding the city of Brockton. The data as shown applies to the plan in its fifth year of implementation, that is, after the system has been improved over a period of four years.

Table 3-3

Cost of Fixed Route Service to Towns

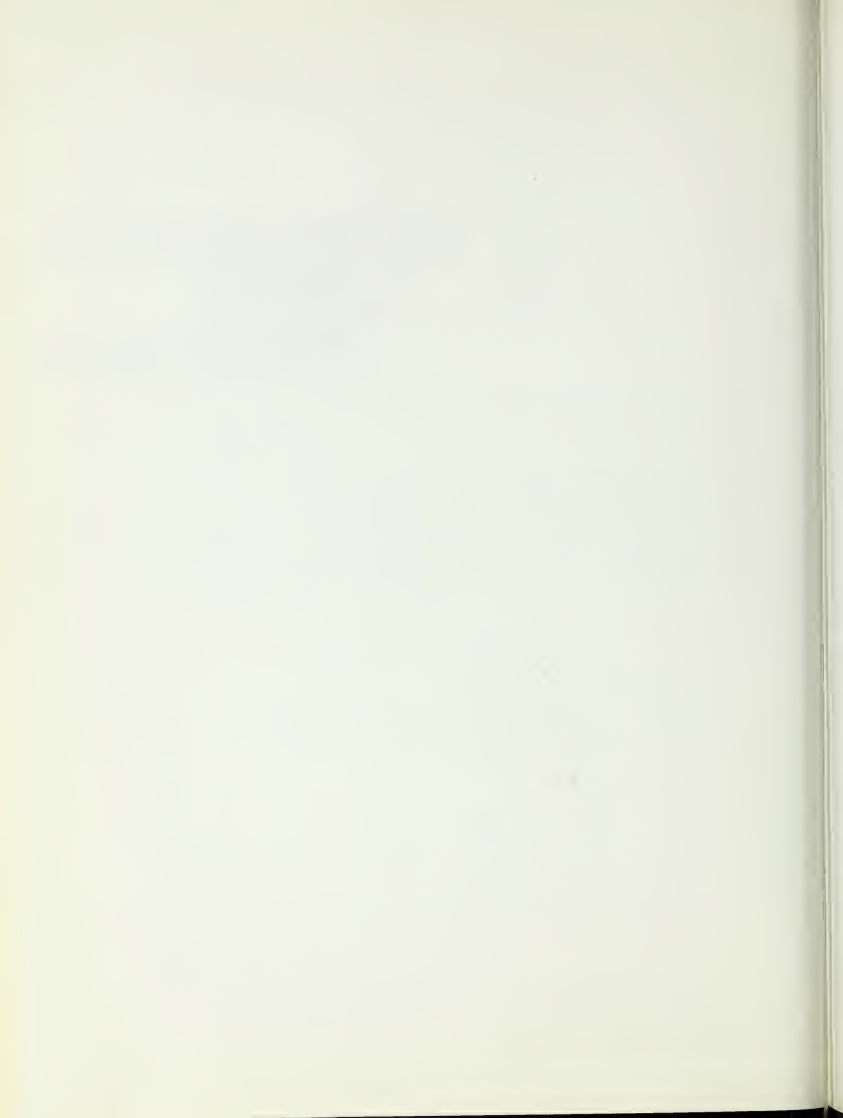
<u>Town</u>	<u>Daily Hours of Operation</u>	<u>Daily Revenue Bus-Miles</u>	<u>Total Annual Operating Costs¹</u>	<u>Local Share</u>	
				<u>Cost For Low Ridership</u>	<u>Cost For High Ridership</u>
Abington	14	182.0	\$ 45,652	\$10,992	\$ 9,117
Avon	14	159.6	40,395	7,549	6,174
Bridgewater	14	84.0	21,305	5,145	4,245
Easton	14	156.8	39,565	9,105	7,425
Stoughton	14	159.6	40,395	9,296	5,546
W. Bridgewater	14	173.6	43,992	10,626	8,726
Whitman	14	179.2	45,376	10,959	9,134
			\$276,680	\$63,672	\$50,397

1 These statistics include apportioned administrative and bonding costs.

Demand-Responsive Service

In addition to looking at demand-responsive service as an alternative transit system, the study explored this type of service for meeting the needs of the elderly and handicapped. As recommended in Section 4.6, demand-responsive service would be provided in the city of Brockton and in the surrounding towns at their option as they join BAT.

4.0 RECOMMENDED TRANSIT SYSTEM IMPROVEMENTS



4.0 RECOMMENDED TRANSIT SYSTEM IMPROVEMENTS

As discussed in the previous chapter, a variety of alternatives have been investigated, and a number of them discussed and analyzed in detail. The study Steering Committee, the JTC, and the Council finally adopted one of the alternatives (LE-Radial Fixed Route Expanded Service). The recommended alternative suggests demand-responsive services at the discretion of member municipalities. This would satisfy the special needs of the elderly, handicapped, and disadvantaged groups in addition to those individuals who live too far from recommended fixed route service.

Following its selection, the alternative recommended was detailed from the point of view of specific routes to be served, frequency of service, and the time period in which the specific improvements should be made. These detailed recommended improvements are discussed in this chapter.

The sequential plan outlined in this chapter points out in detail the improvements which should be made to the system for each of the five years. Primarily, it addresses the capital improvements which should be made, but it also addresses non-capital improvements such as information and promotion programs which are so important to the success of the system.

It is important to realize that any improvement which is made, such as the initiation of bus service in a corridor where it has not existed, or the improvement of frequency on an existing line from 30 minutes to 15 minutes is, in fact, a test. That is, an effort has been made to predict the results of the improvement, but these estimates are not made with hard, pure scientific data. Therefore, the actual implementation of the improvement must be continually monitored and revisions must be made to the plan periodically. This sequential plan will require continual review, update, and modification. To work on that effort, OCPC is including in its Unified Transportation Work Program tasks for monitoring of the improvement program.

As previously mentioned, this is a five-year Transit Development Program. There are several reasons for spreading the improvements over five years in addition to recognizing that it is an UMTA requirement. Following are other reasons:

- Spread the capital costs of the program.
- Stage the improvements so that they serve as tests or demonstrations. That is, if an improvement to the system in the first year does not work out, adjustments can be made and the results and experience considered in future applications.
- Some parts of the plan cannot be implemented until additional towns join the BAT.

4.1 Service Improvements

From the study of system alternatives, one plan for the five-year period was adopted. That plan is shown in Table 4-1. This table shows the recommended capital improvements over the five-year period, including the buses to be purchased, shelters, bus stop signs, etc. The table is broken down into two elements, fixed route service and demand-responsive service. It is recommen-

Sequential Capital Improvement Program

-83-

Table 4-1 (Cont.)

Sequential Capital Improvement Program

Fixed Route System		Demand-Responsive System	
THIRD YEAR			
Buses		Buses (with lifts)	
Whitman-30 min frequency	1 sm bus	Easton	1 sm bus
Bridgewater-30 min freq	1 sm bus	Avon	1 sm bus
W. Bridgewater-30 min freq	1 sm bus	Stoughton	1 sm bus
Locked boxes	3	Locked boxes	3
Radios	3	Radios	3
Bus Stop Signs	156		
Whitman - 64			
Bridgewater - 62			
W. Bridgewater - 30			
Shelters	10		
Benches	5		
FOURTH YEAR			
Buses		Buses (with lifts)	
Abington-30 min frequency	1 sm bus	Whitman	1 sm bus
Locked boxes	1	Bridgewater	1 sm bus
Radio	1	W. Bridgewater	1 sm bus
Bus Stop Signs	65	Locked boxes	3
Shelters	2	Radios	3
Benches	6		
FIFTH YEAR			
Buses		Buses (with lifts)	
Replace 2 '74 flexettes	2 sm buses	Abington	1 sm bus
Service Vehicle - Replace truck		Locked bus	1
		Radio	1

ded that the demand-responsive system be developed to provide feeder service to the fixed route system for those passengers living beyond walking distance. The service should include vehicles specially equipped with lifts to transport the handicapped. The service should also coordinate the vehicles presently owned and operated by special service agencies and towns, such as town buses used exclusively for the elderly. A detailed discussion of demand-responsive service is provided in Section 4.6.

In this section, the plan is broken into further detail, especially the first year phase. In addition, the other recommendations concerning the plan such as the need for promotional programs, public relations efforts, and administrative staff will be discussed in more detail later in this report.

Whether the plan is implemented as proposed depends upon action on the part of local communities. It depends upon whether communities join Brockton Area Transit, and if they join, whether they subscribe to the recommended service. For example, a town might join BAT and subscribe to only half the recommended service in the appropriate implementation year.

Bus Route Improvements

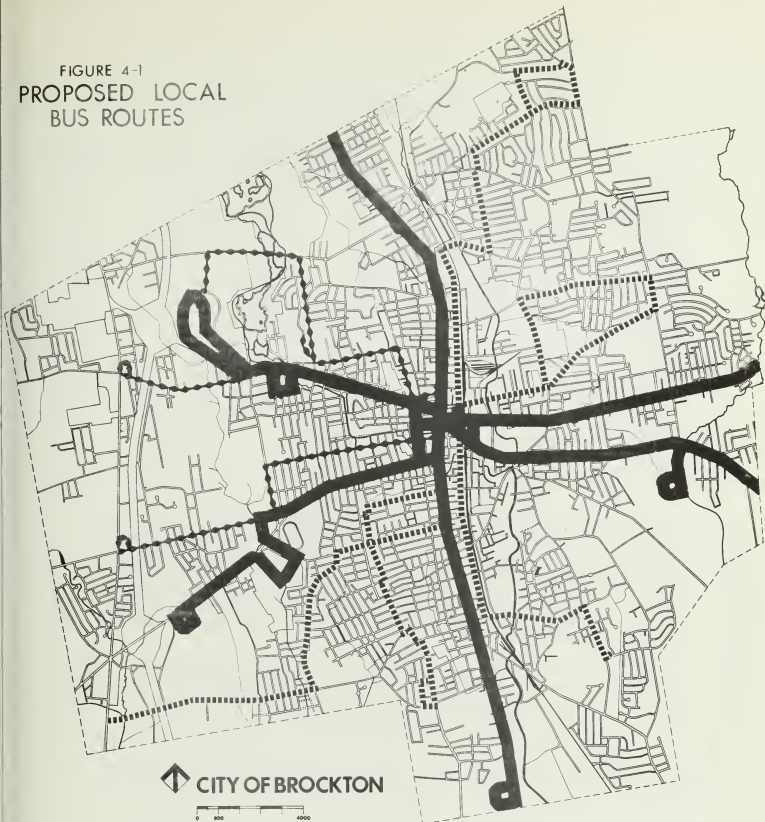
Figure 4-1 shows the local bus routes recommended for implementation in the first year of the improvement program, and Table 4-2 shows the recommended frequency of service for each route, the route mileage for each route, the anticipated ridership on each route and the required number of buses for each route. For the subsequent years, that is, years two through five, the recommended service improvements are found on Figure 4-2.

As noted, in addition to the fixed route service as shown on the maps in this section, it is recommended that the towns which join BAT also consider providing demand-responsive service.

Proposed Local Bus Routes: Each corridor area which should be provided bus service was looked at in detail and the proposed bus route analyzed and discussed with the city planning office and the present transit operator. Figures 4-3 through 4-22 are sketches of each bus route showing the details of the route and the major transit ridership generators along the route. It is recommended for the first year that each route which travels to the downtown area (Main and School Streets) be connected with another bus route so that each bus travels across town. The first year recommendation is for 13 bus routes, meaning that 12 can be linked into six cross-town routes and one will remain as a fringe-to-downtown route. Following is the recommendation concerning the linking of bus routes:

- Campello-Montello
- Crescent-Pleasant
- Center-Belmont
- Belair-Perkins
- Ashland-West Chestnut
- Ames-Copeland
- Torrey

FIGURE 4-1
PROPOSED LOCAL
BUS ROUTES



1980 FREQUENCY

-  15 MINUTES
ALL DAY
-  15 MINUTE PEAK
30 MINUTE OFF PEAK
-  30 MINUTES
ALL DAY

Table 4-2

Local Bus Routes
1st Year - City of Brockton

Route	Proposed Headway		Avg. Weekday Ridership		Number of Vehicles	
	Peak	Off Peak	Present	Proposed	Present	Proposed
Campello	15	15	680	760	1	2
Montello	15	15		683	1	2
Belmont	15	15	489	534	1	2
Pleasant	15	15		476	1	2
Centre	15	15	341	428	1	2
Crescent	15	15		345	1	2
Copeland	15	30	169	351	.5	2
Ashland	15	30		211	.5	2
Perkins	15	30	296	287	.5	2
Ames	15	30		329	.5	2
W. Chestnut	15	30	(2)	355	-	2
Torrey	30	30	(2)	188	-	1
Belair	30	30	(2)	196	-	1

All bus routes in the system provide local service.

Average proposed transit fare is 20¢

(1) Ridership is for first year of service

(2) New route

The above headways are based on average and peak period bus speeds and length of routes. For the new routes assumptions had to be made concerning average bus speeds. It will be necessary before implementing these routes to make test runs with buses. Further it is recommended that the changed service be promoted as temporary until the running times and layovers have been tested in actual use and the schedule revised. Accurate running times can not be developed unless passengers are being picked up.

Fare boxes: The present operation is using the exact fare locked box fare collection system. This study recommends that BAT continue to use locked boxes and that the boxes register the fares. This type of box will provide BAT with the opportunity to periodically count riders as part of its surveillance program.

Bus Stop Signs: Bus stop signs should be designed to designate the bus routes which pass by the specific stop, and to display the route layout itself, or indicate the destination of the bus.

The present system of "flag down" service should be revised to a fixed bus stop location service. This will encourage people to use a specific stop, and will reduce or eliminate the possibility of a bus missing a potential rider. It will increase the safety of the service by eliminating the need

FIGURE 4-2
FIVE YEAR SEQUENTIAL PLAN



FIGURE 4-3: CAMPELLO - YEAR 1 (15 MINUTE FREQUENCY/ALL DAY)

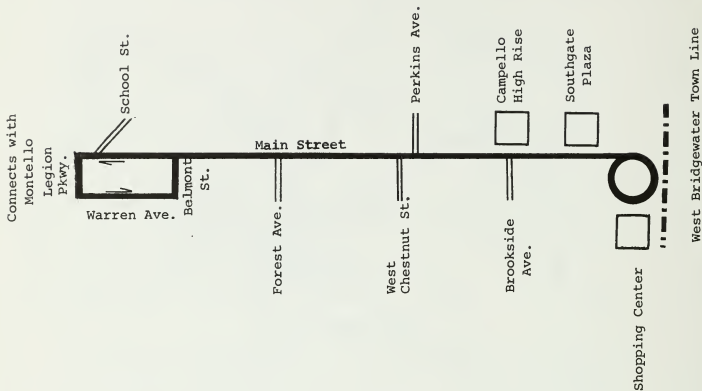


FIGURE 4-4: MONTELLO - YEAR 1 (15 MINUTE FREQUENCY/ALL DAY)

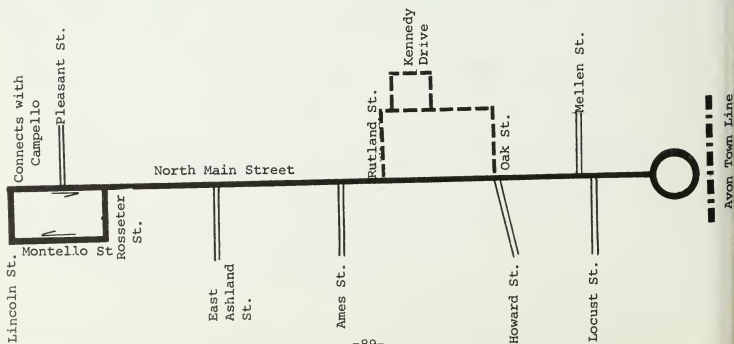


FIGURE 4-5: BELMONT - YEAR 1 (15 MINUTE FREQUENCY/ALL DAY)

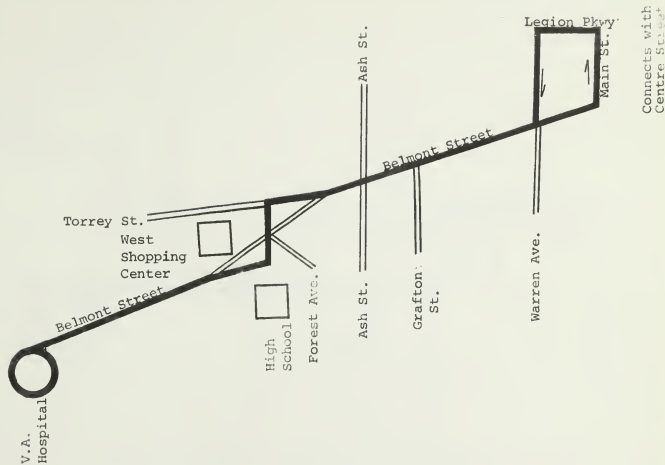


FIGURE 4-6: CENTRE - YEAR 1 (15 MINUTE FREQUENCY/ALL DAY)

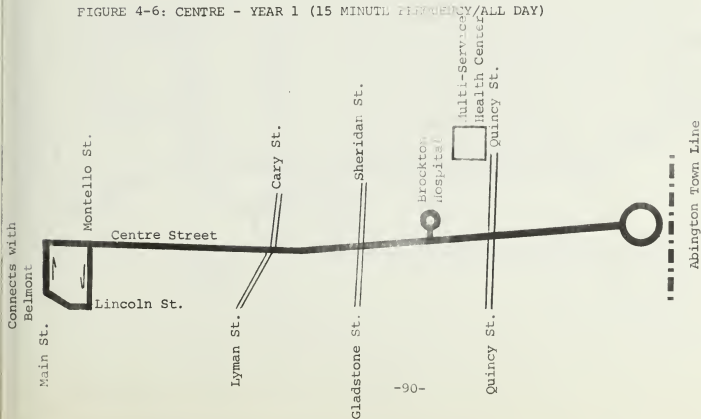


FIGURE 4-7: PLEASANT - YEAR 1 (15 MINUTE FREQUENCY/ALL DAY)

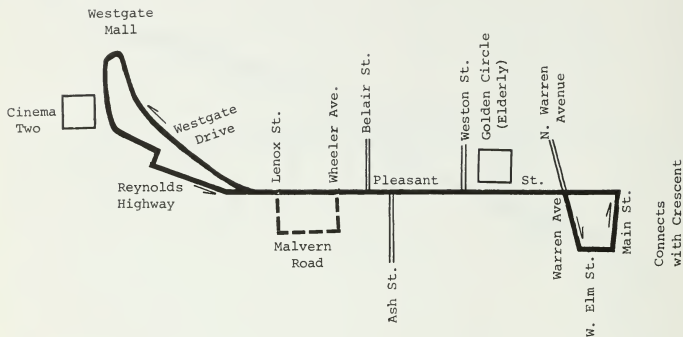


FIGURE 4-8: CRESCENT - YEAR 1 (15 MINUTE FREQUENCY/ALL DAY)

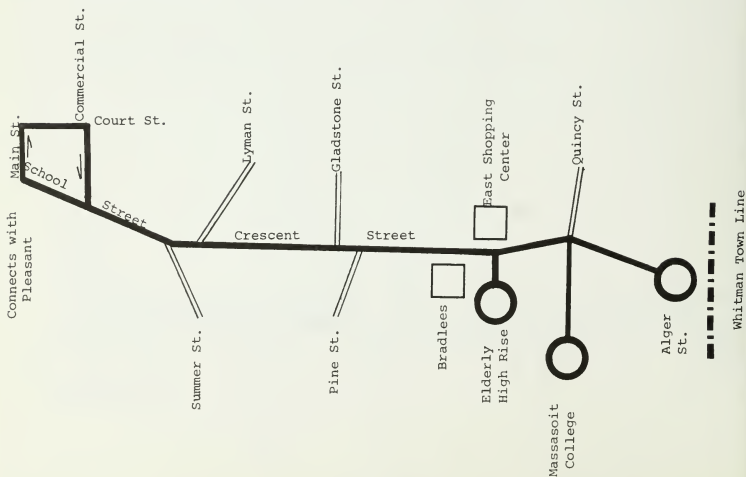


FIGURE 4-9: COPELAND - YEAR 1 (15 MINUTE FREQUENCY/ALL DAY)



FIGURE 4-10: AMES - YEAR 1 (15 MINUTE FREQUENCY/ALL DAY)

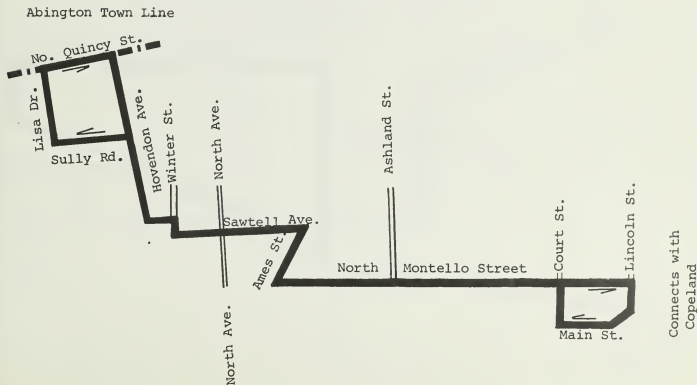


FIGURE 4-11: ASH/WEST CHESTNUT - YEAR 1 (30 MINUTE FREQUENCY/ALL DAY)

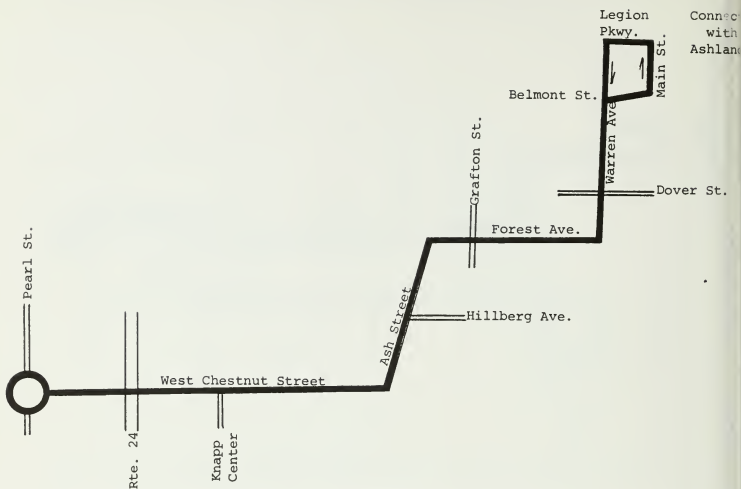


FIGURE 4-12: ASHLAND - YEAR 1 (30 MINUTE FREQUENCY/ALL DAY)

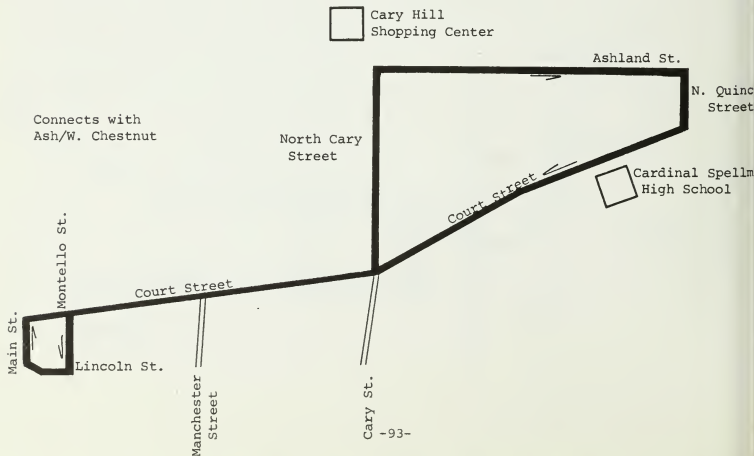


FIGURE 4-13: OAK/BELAIR - YEAR 1 (30 MINUTE FREQUENCY/ALL DAY)

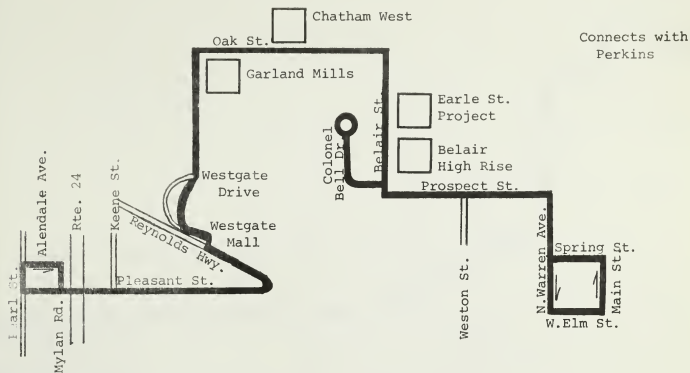


FIGURE 4-14: PERKINS - YEAR 1 (30 MINUTE FREQUENCY/ALL DAY)

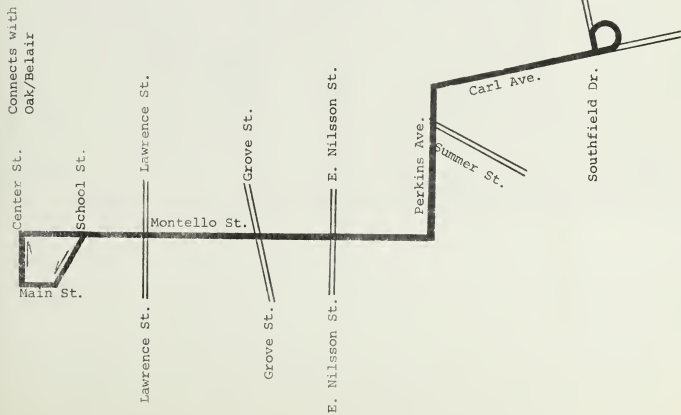


FIGURE 4-15: ELM/TORREY - YEAR 1 (30 MINUTE FREQUENCY/ALL DAY)

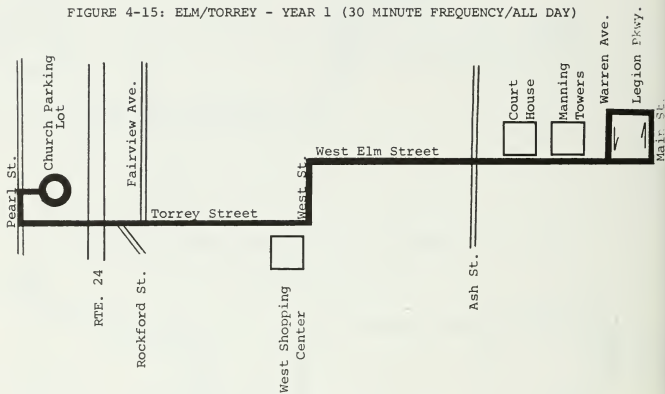


FIGURE 4-16: ABINGTON VIA CENTRE - AFTER YEAR 1 (30 MINUTE FREQUENCY/ALL DAY)

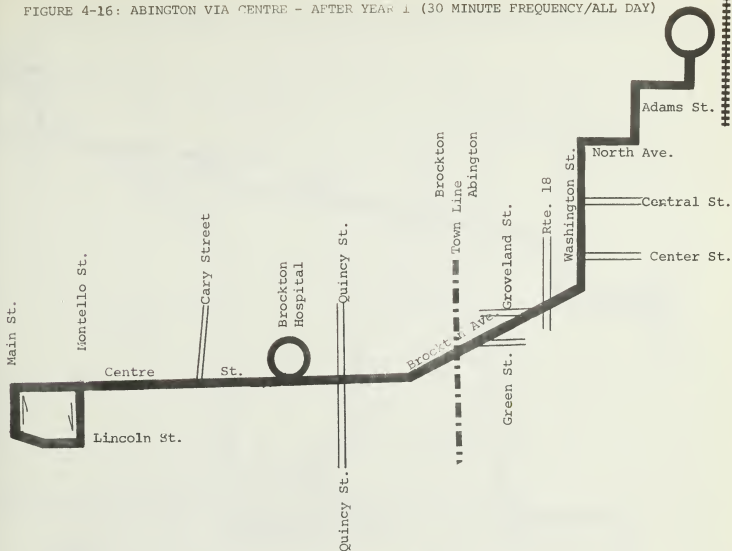


FIGURE 4-17: AVON VIA MONTELLA - AFTER YEAR 1 (30 MINUTE FREQUENCY/ALL DAY)

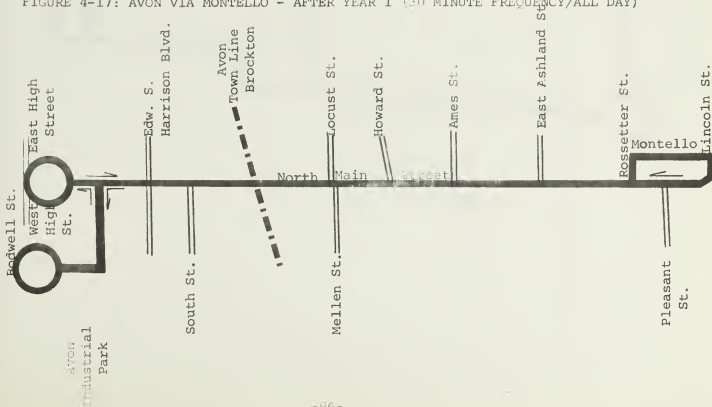


FIGURE 4-18: EASTON VIA BELMONT - AFTER YEAR 1 (30 MINUTE FREQUENCY/ALL DAY)

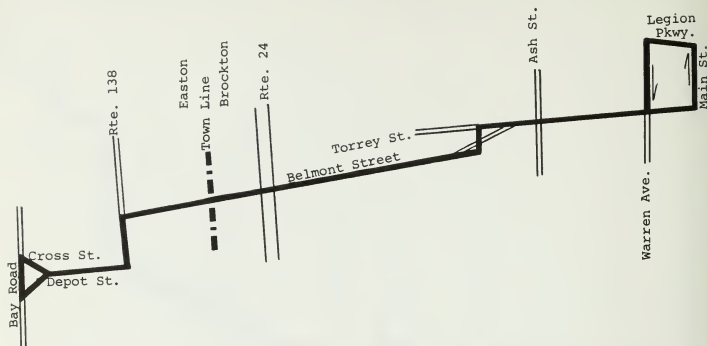


FIGURE 4-19: EASTON VIA ELM/TORREY - AFTER YEAR 1 (30 MINUTE FREQUENCY/ALL DAY)

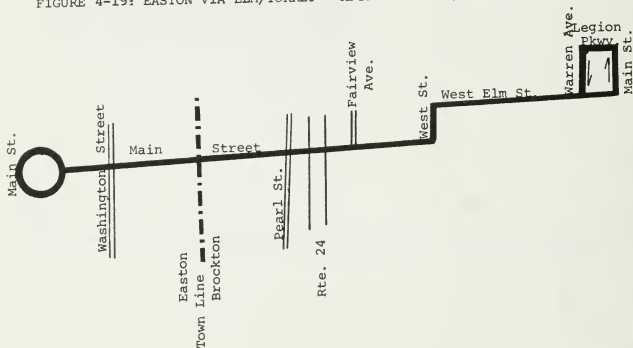


FIGURE 4-20: STOUGHTON VIA OAK AND BELAIR - AFTER YEAR 1 (30 MINUTE FREQUENCY/ALL DAY)

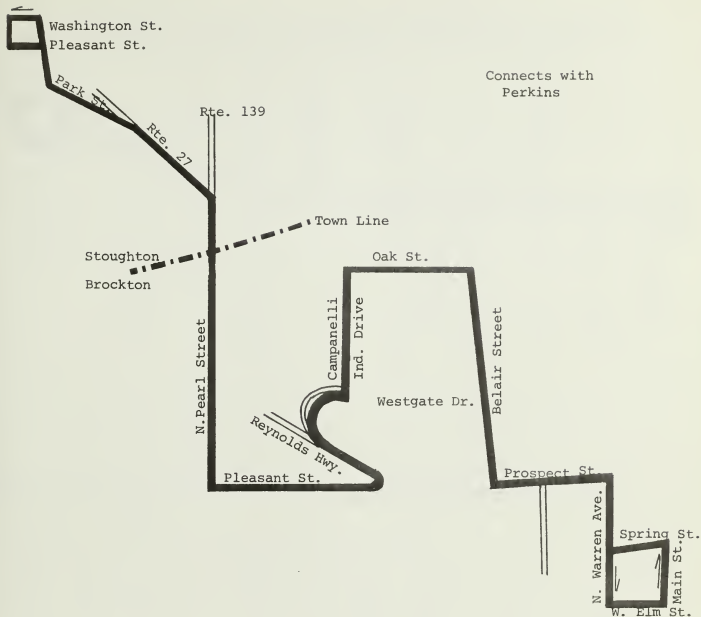


FIGURE 4-21: BRIDGEWATER/W. BRIDGEWATER VIA CAMPELLO - AFTER YEAR 1
(30 MINUTE FREQUENCY/ALL DAY)

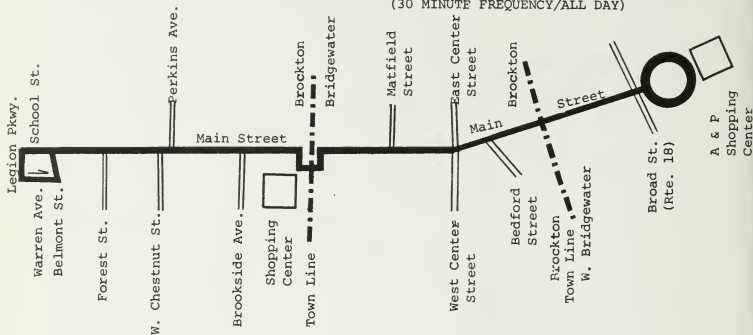
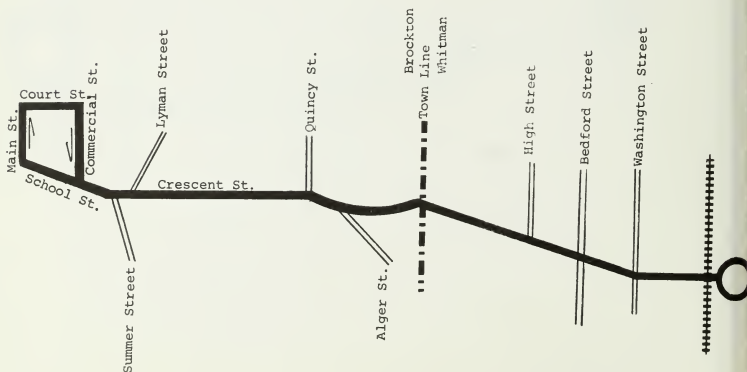


FIGURE 4-22: WHITMAN VIA CRESCENT - AFTER YEAR 1 (30 MINUTE FREQUENCY/ALL DAY)



for passengers to walk between cars to flag a bus, and it will, in effect, promote bus service by having unique bus stop signs and painted curbs. To some extent, bus service will become more efficient because the buses will be able to pull into areas which are exclusively reserved for them.

Bus Shelters: Inventoried as part of the study were bus stop locations with a high boarding activity. These areas were studied in an effort to develop recommendations for the installation of bus shelters to encourage ridership by protecting riders from the elements. The bus shelters should include displays of bus routes and time schedules for all service in the area. The shelters should be attractive and easily cleaned. In addition to installing the shelters, the administrative staff of BAT should encourage large businesses and employers such as shopping centers and manufacturers to take steps to provide some sort of shelter for bus passengers leaving their facilities. Following is a list of locations where shelters are recommended. This list includes shelters at high rise housing units for the elderly.

1. Northerly side of West Chestnut Street opposite Knapp Center
2. Northerly side of West Chestnut Street at corner of Liberty Street
3. Corner of West Chestnut and Pearl Streets
4. Easterly side of Main Street at the Campello elderly high rise
5. Easterly side of Belair Street at Earle Street elderly project
6. Easterly side of Belair Street at Belair Street elderly high rise
7. Northerly side of Crescent Street opposite Caffrey Towers elderly project
8. Corner of Ames Street and Sawtell Avenue
9. Corner of Grafton Street and Forest Avenue
10. Corner of North Main Street and Oak Street

Benches: Benches should be provided at major stops which do not have quite the number of boarding passengers as the shelter stops, but which are used frequently by the elderly and handicapped. Actual locations for benches have not been established. In discussions with the Brockton Planning Department it was suggested that twenty benches would be reasonable for the first year and that the city in cooperation with the BAT would determine where they should be located.

Transfers: It is recommended that transfers between bus routes in the Main and School Streets area be free, and that each bus route meet in the downtown area on the hour and half hour for the 30-minute frequency routes and every 15 minutes for the 15-minute frequency routes so that passengers can transfer between routes efficiently and continue their trips. Table 4-2 is a summary of the recommended frequencies for each route.

It is also recommended that consideration be given to alternating the outer end of each bus route in the future to reduce the transfers required. For

example, on the first run, the Campello route should link with Montello, on the second run with Pleasant, on the third run with Ames, and so on.

Hours of Service

The Home Interview Survey conducted as part of the study shows that 67 percent of all trips made during the average day for all modes of travel took place between 6 A.M. and 6 P.M. and that 82 percent of the trips took place in the 14-hour period from 6 A.M. to 8 P.M. Figure 2-7 is a display of the trips by hour from the Home Interview Survey. Based on these data, it is recommended that bus service be provided from 6 A.M. to 8 P.M. Peak period service, which is a higher level of service, should be provided from 6 A.M. to 9:30 A.M. and from 3:30 P.M. to 6 P.M. The remaining hours of the service day should be considered off peak periods.

Weekend Service: It is recommended that service be provided on Saturdays from 8 A.M. to 6 P.M. and that service be the same for each hour of the service day, that is, that no peak period service be provided on weekends.

It is recommended that service not be provided on Sunday unless there is a demand in the future for a subscription type of Sunday service.

Service to Rural Communities

In conducting the study, the staff recognized the need for public transportation service in the rural communities. In fact, the Attitude Survey which was conducted in all communities in the area showed a latent demand for transit service. This service is needed especially by the elderly and those individuals without an automobile available for transportation. The real problem which presents itself in providing service to the more unpopulated communities is the cost associated with that service. Basically, rural communities do not have the population densities, the elderly concentrations, the minority concentrations, or the low income areas which support efficient transit service. In addition, car ownership in the more rural communities is higher than in urban communities.

The study has recommended that if there is a serious interest on the part of local governmental officials in providing transit service to their communities, they should work with BAT to discuss appropriate methods and actions.

The staff feels strongly that the only type of service which can be adequately provided in the rural areas is demand-responsive service operating only when individuals are in need of service. Such demand-responsive service would feed into the town-to-Brockton fixed route service recommended for the towns. This service can also be provided by shared taxi rides. In effect, taxi service is already available, but the problem is that the cost of ridership is too high for many of the low income residents. Subsidized taxi operations and shared rides can reduce the cost to the potential rider, however this requires subsidies on the part of both the local communities and the state and federal governments.

Fringe Parking Facilities

It is recommended that a number of fringe parking facilities be further analyzed and constructed to induce bus ridership. These lots should be developed

outside the downtown Brockton area and in close proximity to major highway facilities.

Fringe lots can serve a variety of purposes. If the facility is served by local buses into Brockton, a rider can park in the lot and use the local service. If the lot is served by intercity buses, as Westgate Mall is served by Plymouth and Brockton, a person can park in the lot and use long haul service to Boston. Further, the lots located close to expressway intersections can be used to encourage carpooling, especially to Boston.

Brockton Lots: It is recommended that fringe lots in Brockton be considered at the following locations:

- Intersection of Routes 24 and 27
This lot could be in the location of Westgate Mall, if another parcel is not available.
- Intersection of Routes 24 and 123
This lot could be located at the interchange itself, or just west of the interchange in the vicinity of Marshall's Corner.

The development of these fringe parking facilities will reduce the demand for parking in the downtown areas. At present, people working in the downtown area and driving from the suburbs do not have the opportunity to use local service in their towns of residence, and once in the car and driving toward downtown Brockton, do not have a place to leave the car to catch local service. Therefore, these facilities will lessen the demand for long-term parking in the downtown area.

Suburban Lots: In addition, it is recommended that fringe parking lots be constructed in the following suburban locations.

- Intersection of Routes 24 and 106 in West Bridgewater
This lot could be located in a state-owned parcel and is on the JTC Short Range Transportation Priority List. This area is currently served by Almeida.
- Intersection of Route 24 and Dykeman Way in Avon
This intersection should be located to the west of the interchange and could be another feeder lot for Boston-bound commuter buses.

It is recommended that the state play a major role in the development of the fringe parking facilities, specifically, that the state design and construct the facilities, and that the state coordinate their planning and design efforts with OCPC.

Terminal Facility

A transportation terminal in the Brockton area should be developed to serve a number of travel demands. Most important, the terminal should serve as a facility to provide the traveler with as many mode changes as possible. It should provide the traveler a transfer point from long-distance bus service (Boston to Brockton) to local bus or taxi service in the area.

Therefore, it is important to locate the terminal in an area where ready transfer can be made between all the various modes. There are two reasonable locations to be considered for the terminal. One is in the Westgate shopping area, the advantage of which is to provide quick access to the expressway to the north (Boston) and the south. The other location is in the downtown area.

Long haul bus service is presently available from downtown Brockton, that is, Main and School Streets, by both the MBTA and Plymouth-Brockton. In addition, all local service in the region radiates from the Main and School Streets area. Individuals wishing to transfer between modes would find it much more convenient to transfer at Main and School Streets than to transfer at Westgate. The problem in transferring at Westgate is that it would probably require more than one transfer to complete a trip: that is, a transfer between the Boston-Brockton bus and local service to Main and School Streets, then a transfer at Main and School Streets to a final destination. The disadvantage of Main and School Streets is that there is a parking problem for those individuals wishing to leave their automobiles at the bus terminal to take the bus on a long distance trip. However, that disadvantage is overshadowed by the advantages to the users who will not be using the automobile for part of the trip.

Terminal Type and Characteristics: The bus terminal facility most appropriate for the city of Brockton requires the provision of an area for layover and queuing of vehicles, and for the transfer of passengers.

The layout of the terminal should provide for a land arrangement which will enable vehicles to load, unload, and layover in an efficient and orderly manner. The ability to effect such a configuration depends upon the shape and size of the parcel of land available.

Passenger loading requirements depend upon the magnitude and character of the patrons. In the city of Brockton, most of the intra-terminal passenger activity will be for transfers or origination of an outbound trip.

The construction of shelter structures should be deferred until routings, schedules, and headways are finalized and operating successfully. Protection from the elements ultimately should be provided passengers awaiting service.

The configuration and arrangement of loading platforms is to be determined by the amount of headway time available between runs and the number of patrons boarding the vehicles.

Design Criteria: It is recommended that 12-foot lanes be used when possible, which is adequate for an 8.5-foot bus. Where permanent structures such as loading platforms are being planned, it is essential that the necessity to accommodate wider vehicles in the future be considered.

Shelters or canopies erected to protect patrons from the elements should be at least 12 feet in height.

Passenger loading areas can be at ground level or on a platform. The ground level arrangement requires pavement markings to delineate bus lanes and passenger loading areas. The passenger area should be wide enough for safe movement of patrons. An aisle or platform width of eight feet is recommended. The raised platforms provide added convenience and safety in the loading area.

Alternative Terminal Sites: The selection of a site for a downtown bus terminal depends upon several conditions, the most significant being:

- The availability of underdeveloped land suitable for terminal use in physical and financial terms.
- Access to and from the land via the downtown street system, particularly with reference to the existing or proposed bus route locations.

Because the Brockton terminal will be used primarily for layover and transfer activities as opposed to a multi-modal terminal to which commuters drive to park for a long-haul trip, the availability of parking facilities nearby is secondary, but desirable.

There are four parcels of land in downtown Brockton which are close to the Main and School Streets area which is presently used as a focal point for bus routes serving the city. Figure 4-23 indicates the location of each. The existing on-street loading areas will be inadequate when an increase in service is implemented. The transfer of this operation to an off-street facility will enhance traffic movement and circulation in the downtown area.

Terminal Recommendations: In that the buses providing local service in the area all come together, transfer passengers and depart at the same times, there is a definite need to provide an off street terminal facility in downtown Brockton. It is recommended that the site east of the Plymouth Home-National Bank (site A, Figure 4-23) be acquired in the first year of implementation (estimated value of this parcel is \$170,300), and that a request be made for \$72,000 to design and construct an interim off street facility. It is further recommended that a detailed investigation be made concerning the need for a structure at a later date, and that an engineering and architectural feasibility study be conducted if it is agreed that a structure is required. The decision to construct a substantial structure should be based on public usage of the improved system.

In making this recommendation it is important to understand that UMTA will only fund that portion of the terminal which is used for urban transit service. If in further study and detailing of the terminal it is thought that a portion of the facility would not be used exclusively for urban transit service, then requests for UMTA funds could include only that portion of the facility meeting the exclusive urban transit use criteria.

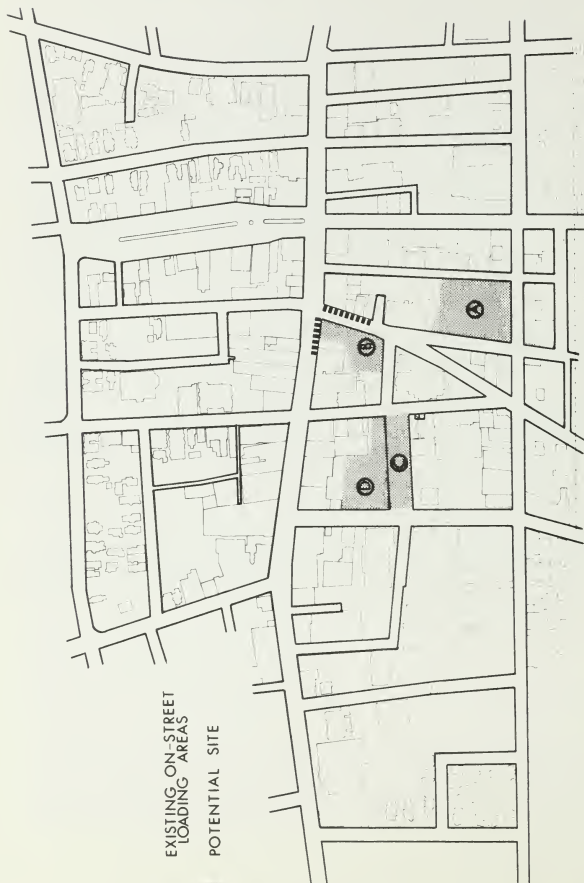


FIGURE 4-23

ALTERNATE BUS TERMINAL
SITES

 DOWNTOWN BROCKTON

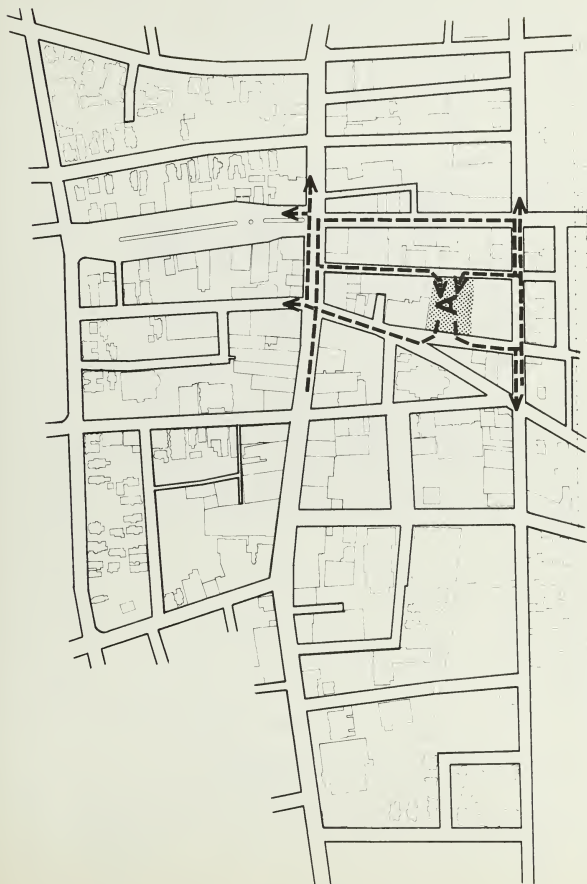


FIGURE 4-24

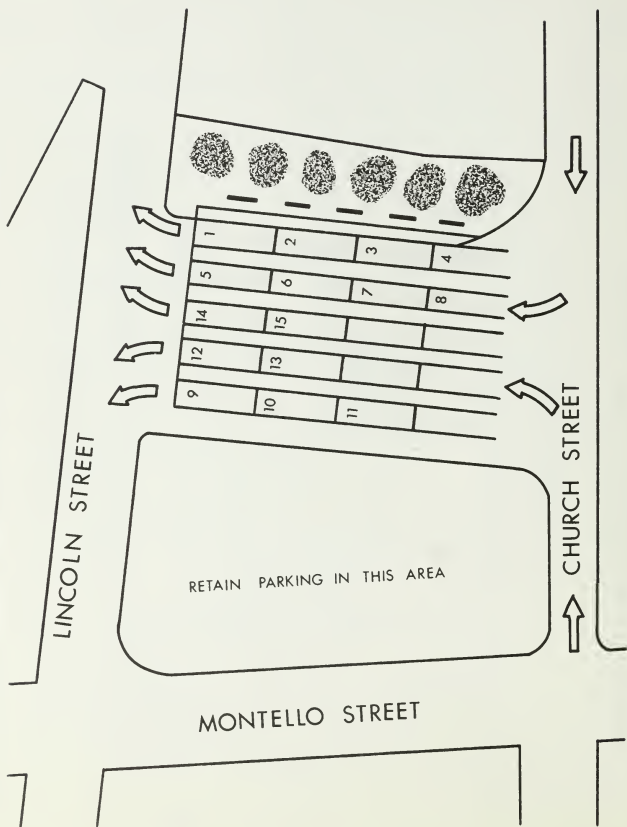
PROPOSED CIRCULATION
PATTERN FOR
SITE A

 DOWNTOWN BROCKTON

0 300'

FIGURE 4-25
SUGGESTED TERMINAL LAYOUT
ALTERNATIVE "B"

SCALE 1" = 50'



4.2 Storage and Maintenance Improvements

BAT should purchase or construct its own storage and maintenance facility as soon as possible. Presently, BAT, in subsidizing the operation, pays rent on the facility which the operator is using. Either by constructing a new facility or by purchasing an existing facility, BAT can request 80 percent federal money for the garage, bond the 20 percent match, and include that sum in the operating cost for the length of the bonding. In turn, the state will in effect, pay 50 percent of the bonded amount. After the garage has been paid off, BAT will own the facility and will not have to include rent in the operating costs of service. The facility will be leased to the operator.

In owning the facility, BAT will have a greater flexibility in contracting with an operator to provide service in the transit area. That is, BAT will own rolling stock, the garage, and all the additional maintenance and support equipment. The operator will then provide only drivers and experience, as opposed to providing maintenance and storage facilities as well.

The facility should be 12,000 to 15,000 square feet - large enough to store 15 to 20 buses indoors, depending upon their size. The garage should have two floor lifts for maintenance of vehicles. It should have a drive-through exterior washing machine, a vacuum cleaner system for bus interiors, a steam cleaner for the engines, a parts room, office space for the operator, and a maintenance area.

Garage Facility Recommendation

Until BAT acquires its own storage and maintenance facility it is recommended that the operator provide an adequate facility, and that in the second year, an engineering and architectural feasibility study be conducted to determine the location and cost of a new garage. The Steering Committee did recommend that BAT obtain its own garage and repair facility in the future. Therefore, the initial recommendation is that there be an engineering and architectural feasibility study which should address the following subjects:

- Site location - existing or new facility
- Traffic impact and circulation at facility
- Appraisals of existing facilities
- Develop detailed garage requirements - floor space, etc.
- Recommend specific site and cost requirements
- Environmental consequences

Whether a new or existing facility, the structure should include the following:

- Driver lounge with lockers
- Tire room
- Battery room
- Parts room
- Repair shop

4.3 Fares

There is an interest on the part of U.S. DOT and there has been an interest on the part of the city of Brockton and BAT to provide public service to the elderly and students at a reduced rate. An elderly patron with proper identification currently pays a 15¢ bus fare. The 1974 amendments to the 1964 Mass Transportation Act state that an operating agency cannot charge more than half regular fare to the elderly in the off peak periods. It is a goal of this study to recommend a fare structure which will aid in encouraging riders, and at the same time be as economical as possible, especially for those individuals who are living on restricted incomes. The question that must be addressed in this study is what is an economically feasible fare structure for the public in general and for those with financial difficulties. The Latent Demand Survey conducted throughout the study area showed that 15 percent of all those interviewed felt that a lower fare was an important consideration in using service, 42 percent felt that it was of medium importance, and 13 percent said that it was unimportant.

Free Fare

Part of the development of alternative plans and adoption of a specific plan must be consideration of a fare structure. It is the responsibility of the study staff to review various fare structures and make specific recommendations to the Steering Committee, and the JTC. On the other hand, it is the responsibility of the towns which are members of BAT, or towns which must contract with BAT for service, to decide themselves what the fare must be in order to meet a share of the operating costs of the services provided. That decision, made by the members and contracting towns, must be made some time after the completion of the study, when the towns are contracting for service.

The staff has witnessed some interest on the part of committee members and representatives of special interest groups in providing a no fare system for a variety of reasons, some of which are noted below:

- The elderly and the low income cannot afford the 25¢ and 50¢ fares, and should not be charged a fare at all.
- A no fare system would be much more appealing to the public, and considerably easier to promote, and would therefore increase ridership.

There are a number of advantages and disadvantages in providing no fare bus service. Following are comments concerning both:

Advantages

1. Cost to the user
2. Makes promotional programs more appealing
3. The operator does not have to handle money at the end of the day, that is, empty fare boxes, count money, make deposits, etc.

Disadvantages

1. In no fare structures around the country, there has been to some

extent, a problem with individuals, generally adolescents with time to kill, continually riding the free service.

2. The amount of public funds needed to maintain the service is increased.
3. A contract with a private operator will not include an incentive program based on revenue collected, which is the most straightforward type of incentive program to implement.
4. From studies conducted according to U.S. DOT, a no fare system increases ridership as much as 25 percent only for the first few months of the system. Then, with no other changes, ridership returns to the level it was before the no fare system was implemented.

Recommended Fare Structure

It is recommended that the regular fare for fixed route service in the entire service area be 25¢ with elderly, handicapped, and student fares 10¢ all day. Elderly and handicapped passengers should show identification to get the reduced rate, and students should purchase ticket books.

BAT should sell unlimited use bus passes which are good for one month for \$8.00. If an individual used the pass twice every week day, the pass would be worth approximately \$10.00.

Transfers

In many transit operations throughout the country, transfers are provided at no cost, and in other operations transfers range in cost from 5¢ to 15¢. There are several reasons for charging for transfers:

1. It is a source of additional income.
2. The passengers provided with the opportunity of traveling a much greater distance in the system, therefore justify an increased fare.

However, it is the passenger's need to transfer to make his total trip that discourages the use of bus service. The need to transfer is one of the major negative factors in generating bus usage because passengers do not wish to change buses.

Recommendations concerning routings of fixed service in the area give maximum consideration to providing flexible routes to minimize the need to transfer. To be consistent with that philosophy, there should be a free transfer policy.

4.4 Expansion of Brockton Area Transit

BAT presently consists of the city of Brockton alone. In the previous section it was pointed out that local transit service is recommended over the five-year period for six towns in the region. It is recommended that OCPC work in the future to encourage towns to join BAT and to contract for bus service for their residents. Following are the steps to be followed by a town wishing to join BAT.

How a Town Joins Brockton Area Transit

Section of Act

- 3 Town Meeting vote (simple majority) to join BAT (town must be contiguous).
- 3 Town receives approval of Secretary of Transportation and Construction to join BAT.
- 5 Chairman of Board of Selectmen (or designee) is appointed member of the Advisory Board.
- 5 Advisory Board votes to provide service in that town and selects a private carrier.
- 6(i) Carrier must obtain a street license (G.L. Ch. 159A) from Board of Selectmen of that town.
- 6(f) BAT and the carrier enter into a contract for service.

In the event that towns wish to obtain service at a period of time earlier than recommended in this plan, it will be necessary for that town to join BAT or contract with BAT at an earlier date. In addition, in the future, some of the towns which are contiguous to member towns might wish to obtain bus service even though service has not been recommended. With the assistance of OCPC and BAT, such towns must address the benefits of bus service and the cost to the local community. If the town then decides to contract for service, it should join BAT. Figure 4-26 shows the recommended expansion of BAT membership over the next five years.

BROCKTON TRANSIT STUDY AREA

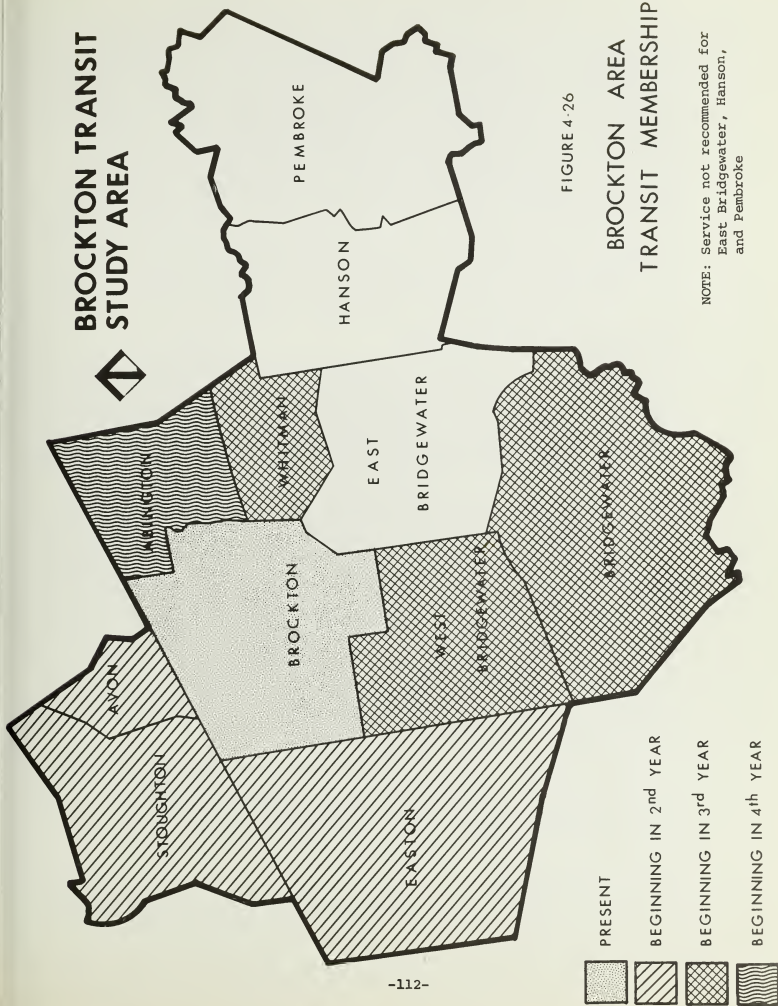


FIGURE 4-26

BROCKTON AREA TRANSIT MEMBERSHIP

NOTE: Service not recommended for East Bridgewater, Hanson, and Pembroke

4.5 Meetings with Local Officials and Special Interest Groups

In the development of the plan, the staff has worked closely with the Technical and Steering Committees, the JTC, and OCPC delegates, and has met with local officials on a number of occasions. It has been the intent of the study staff and study committees to develop a plan which is acceptable to the local officials who will be required to make decisions concerning the implementation of the plan and the appropriation of the necessary funds. This objective has more importance in the first year of implementation than it does in the fifth year. It is extremely important to develop a plan for the first year which is acceptable to the local officials for they must act in the very near future. Those recommendations made for the later years of the plan can obtain the approval of the local officials at a later date. With the efforts of a full-time Administrator, the officials can be apprised of the advantages and disadvantages of supporting the recommended improvements. In other words, improvements recommended for the fourth and fifth years are not as critical to the implementation of the plan as are those recommended for the first year, and in some areas, a significant amount of public relations work will be required to obtain the approval of local elected officials.

Discussions with Local Communities

After alternative plans had been developed, and consideration given to those plans which had the greatest likelihood of being implemented, the study staff made an effort to present the plans and later, the recommended transportation plan to the non-member towns. This was done to obtain their reactions to the recommendations, and to get an indication of their interest in joining BAT in the future so that the recommendations can be implemented. Presentations had been made in Avon, Easton, and Stoughton.

Although there appears to be a real interest in the amount of service which can be provided within their local communities with the financial assistance of the state and federal governments, there appears to be a reluctance on the part of the communities to join BAT. This reluctance exists for a number of reasons. Many elected officials feel that joining an authority is obligating them to financially participate beyond a level at which they are willing to participate. They fear that they might not be able to leave an authority should they wish to do so. In addition, many local elected officials do not have a clear mandate from their local constituents as to whether there is a need for local bus service, and until area residents make that need known, local officials probably will not be able to obligate funds and join BAT. Probably one of the most important issues is that the local official does not really understand what improved service will mean to his community and will probably only understand after the city of Brockton has improved its service and has gained the acceptance of the residents of the city.

It appears that the recommendation that Brockton be the only town belonging to BAT in the first year, with other towns beginning to join in the second year is reasonable. With this approach to BAT membership, towns will be able to observe the improvements taking place in Brockton before they decide themselves to join.

Special Interest Groups

Social service agencies and special interest groups were involved in the study

from the outset. After the Technical and Steering Committees were established, the staff set up two sub-committees, one made up of the elderly agencies and organizations within the region, and the other made up of representatives of handicapped, low income, and other groups supporting the disadvantaged. Two meetings were held with each group and a special survey was conducted to determine the transportation service currently provided by area agencies. The staff requested thoughts and ideas on the need for improved transportation service through surveys of the elderly and Spanish-speaking. Each sub-committee was also asked to react to the recommendations developed by the staff. The participation by these interest groups was very encouraging and assisted the staff in the development of plans to meet special interest group needs.

4.6 Recommended Service for the Elderly and Handicapped

As noted previously, a special effort was made to determine the transportation needs of the elderly and handicapped. Since the Radial Fixed Route Expanded Service alternative which was adopted does not fully meet the needs of those with special mobility problems, it was recommended that BAT also provide demand-responsive service.

The following specific recommendations were made:

1. BAT will serve as the agency to organize and coordinate the service presently being provided.
2. BAT will contract with a private operator to provide service which cannot be accommodated by fixed route service.
3. BAT will develop a billing procedure which the private operator will use to bill agencies for their clients.
4. BAT will purchase required equipment and facilities which will be leased to private operators.

Table 4-1 illustrates the proposed implementation of demand-responsive service in Brockton beginning in the second year. Two of the small buses to be requested as part of the initial Capital Grant Application would be specially equipped with hydraulic lifts, padded stanchions, low steps, comfortable seats and spaces for wheelchairs. These two buses would be available during the first year of implementation, though it is expected that the actual demand-responsive system will not be operative until the second year.

As additional communities join Brockton Area Transit, the demand-responsive system will be expanded. As indicated in Table 4-1, demand-responsive service would be extended to Easton, Avon and Stoughton during the third year; Whitman, Bridgewater and W. Bridgewater during the fourth year; and Abington in the fifth year.

It is recommended that the demand-responsive service be provided on an advanced reservation basis. This will permit more efficient scheduling and allow for grouping of riders. For those riders whose fare would be covered by a special agency, pre-registration will be required. A special file will be established for those whom the special agencies will cover. The agencies would confirm coverage prior to each trip or on a periodic basis for long term clients. Billing for service provided to special agency clients could be on a monthly basis.

The cost of service to the passenger or special agency would depend upon the community of residence. For instance, the fare in Brockton might be 25¢ to 50¢ while the fare in the towns might be 50¢ to 75¢. The rate might be based on some ratio of revenue to operating costs for regular service. Passengers using the service in towns which contract with BAT rather than join BAT must pay the full cost. It is assumed that the passenger will pay a share when obtaining service and that the town will be billed for the difference.

A private carrier would be contracted by BAT to operate the demand-responsive service. The private operator would provide drivers, supervision and maintenance.

an answering service and vehicle dispatch; and vehicle storage until a BAT garage is available. The private carrier would charge BAT for operating costs plus profit.

The following is the recommended schedule for implementing demand-responsive service.

First Year

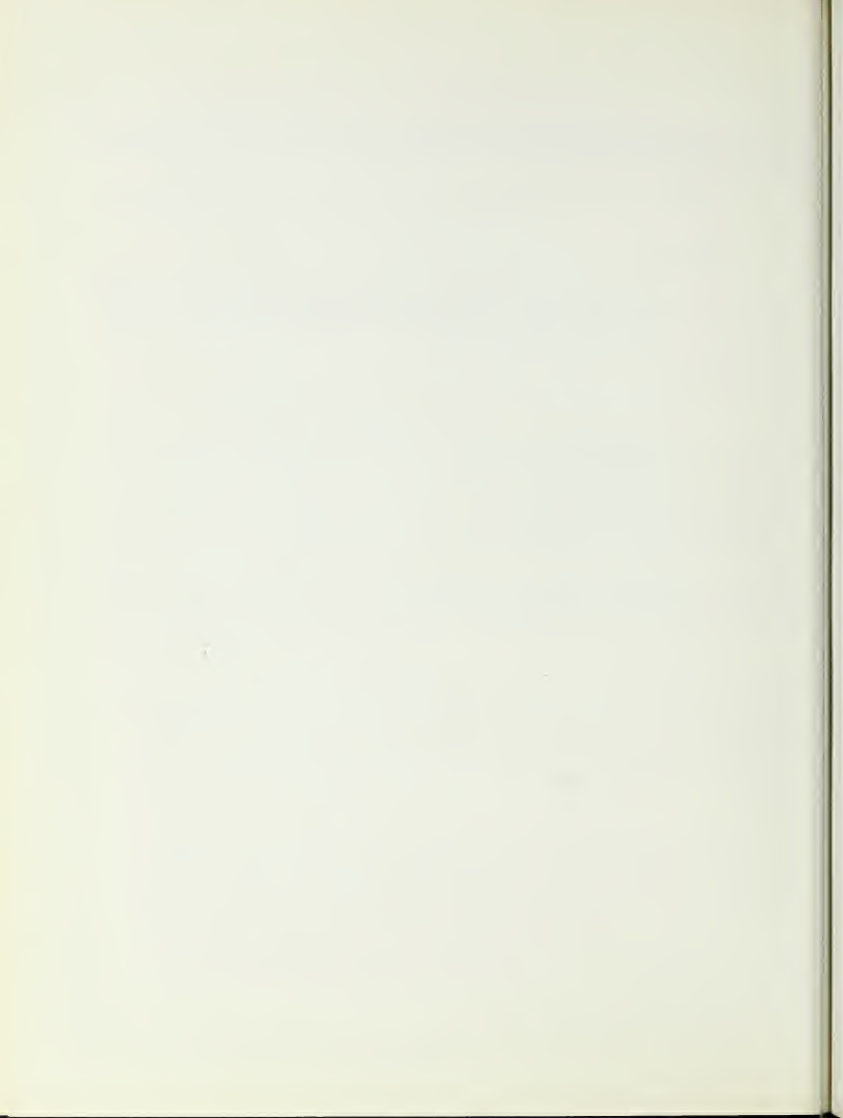
1. BAT will develop procedures for bringing together all service through a private operator and under the sponsorship of BAT. Also included in this period is the development of procedures for charging services to various agencies. Two specially equipped buses would be available during this planning phase.

Second Year

1. Institute operation of service through private carrier.
2. Provide service in towns which are members of BAT or towns which wish to contract with BAT.
3. Purchase additional equipment.

Third, Fourth, and Fifth Years

1. Expand service to new member towns.
2. Purchase additional equipment.



5.0 MANAGING & FINANCING THE PROGRAM



5.0 MANAGING AND FINANCING THE PROGRAM

The first phase of improving bus service is the definition of management functions and responsibilities and the acquisition of funds for both capital improvements and subsidies. The recommendations and detailed plans have been discussed and detailed previously. The next issue is the development of a management system and staff which will make the plan work. This requires more than just a staff who will obtain funds to purchase new rolling stock; it requires a staff who will assure that the contracted operator delivers the service which he is contracted to provide, and management which will develop appealing promotional campaigns and public relations programs to encourage ridership.

5.1 Organization and Management

The management of the transportation system will be by the BAT Advisory Board as constituted by Chapter 114L. As new member towns join BAT, they will become members of the Advisory Board in accordance with the requirements of the statutes. Following are strong recommendations concerning the hiring of an administrative (management) staff by the BAT Advisory Board. It will be the responsibility of this staff to manage and administer the local bus service in the BAT area.

BAT Staffing

BAT will be responsible for maintaining and promoting the bus service, making the service as efficient as possible, performing checks on the operator, and expanding and improving the service as necessary. Therefore, BAT must be staffed to ensure effective performance of these functions. The following positions should be considered:

Administrator: The key to the implementation of this plan and to the substantial improvement of local bus service in the city and the region rests with the Administrator, and ultimately with BAT. In effect, the Administrator will be responsible for the development and implementation of public relations programs and promotional programs, bus scheduling, system dependability, bus cleanliness, and the overall public image of the service. Only if serious and significant steps are taken in the promotion of service will the system grow and become more effective. In the past, the service has been administered by the private operator without any financial assistance from government. The operator reduced service, cut out promotional programs, did not clean his vehicles as often as desirable, and generally cut back his expenses. Bus service in Massachusetts today has the assistance of federal and state governments, and with an effective Administrator and an ambitious authority, substantial steps can be taken in the area to improve service. This program proposes improved service over a five-year period. It might be difficult for some suburban communities to accept these recommendations because they have not had local bus service for many years and do not understand that there are citizens in their communities who will use the service. Whether a community does join BAT and contracts for service to some extent is going to depend upon the success of that service in the city of Brockton, and therefore is going to depend upon the persistence of the Administrator and BAT.

Information Operator: A person should be hired who will be responsible for providing service information to the public for all services provided in the

BAT area. An information telephone should be staffed during the hours of bus operation. It might be more efficient to fill this position with two part-time individuals because the service should be longer than the normal eight-hour day.

Clerk-Service Examiner: The person in this position should be responsible for: making spot checks of route ridership; checking bus schedule adherence; performing trouble-shooting functions; maintaining office records for the Administrator; distributing promotional material, and checking conditions of shelters, benches, bus stop signs, to report deficiencies to the Administrator.

Implementation Responsibilities of BAT and OCPC Staffs

In the process of conducting the study there have been a number of discussions on the responsibilities of each staff in the implementation of the plan. It is important at this point to document these responsibilities. The responsibilities listed below are not the total responsibilities of the staffs, but are those of major concern in the implementation of this plan.

BAT Responsibilities

1. Develop applications for funding.
2. Initiate contracts with operators.
3. Conduct promotional programs.
4. Maintain informational systems.
5. Maintain constant surveillance of service provided.
6. Develop route changes and schedule changes to improve service and revenues in cooperation with OCPC staff.

OCPC Responsibilities

1. Monitor the service, that is, make passenger counts and peak load point counts, on time studies, equipment condition studies, revenue analyses, etc.
2. Analyze ridership and demand data to recommend changes in the implementation of the program in cooperation with BAT staff.
3. Work with regional towns to encourage them to become part of BAT.

5.2 Revenue and Expense Analysis

There are basically two types of expenses to discuss in this section: capital improvement expenses, including the cost of purchasing facilities and rolling stock to provide the service; and operating expenses, including drivers' salaries, maintenance, etc. By providing this service, revenue is generated which reduces the subsidy needed. As part of this study, a detailed analysis was made concerning the capital costs required to develop the system and the costs, revenue, and subsidy associated with providing the service as recommended in the five-year plan.

Capital Costs

The capital costs of the fixed route service portion of the five-year plan are shown on a yearly basis in Table 5-1. There were two basic funding assumptions made for this table which should be noted. First, it was assumed that the federal government would pay 80 percent of the capital costs for the material and equipment listed, and second, it was assumed that the remaining 20 percent would be bonded and become part of the operating expenses of the Authority. As an operating expense, 50 percent would be funded by state. Table 5-2 shows capital costs for the demand-responsive portion of service.

Operating Expenses

The operating expenses by year and by town were based on the level of service recommended for each community and for the specific year in which the service should be initiated. The average fare used in the calculations was 20¢ for Brockton and 30¢ for the towns to compensate for students and the elderly. The rider estimates were used to determine the annual revenue. The difference between total operating costs and the annual revenue is the total amount of the deficit. The local share was based on the above funding policies. Table 5-3 is a summary of estimated community costs for subsidizing service based on the recommended plan outlined in the previous chapter.

All the cost statistics, both capital and operating, have been based on 1975 dollars. The estimates for the cost of each piece of equipment for the system are based on the latest available 1975 cost estimates, and the operating cost statistics are based on the end of 1974 costs for service in the region.

Table 5-4 shows operating costs for the demand responsive service recommended in Section 4.1.

Maintenance of Effort

Maintenance of effort refers to the federal policy stating that, "Federal funds available for expenditure for mass transportation projects under Section 5 shall be supplementary to and not in substitution for the average amount of state and local government funds...expended on the operation of mass transit service in the area involved for the two fiscal years preceding the fiscal year for which the funds are made available". Basically this means that the state and local governments must contribute to the operation of the transit system each year at a rate not less than the average of the two preceding years. Examination of the financial statistics contained in Table 5-3 will show that this policy is satisfied. Further, it should be emphasized that all costs indicated are in 1975 dollars.

Table 5-2

Capital Improvement Program Summary
Demand-Responsive
(1975 Dollars)

Item	Program Year									
	First Units	First Year Cost	Second Units	Second Year Cost	Third Units	Third Year Cost	Fourth Units	Fourth Year Cost	Fifth Units	Fifth Year Cost
Buses										
15-25 Passenger With Lifts @ \$30,000			2	\$60,000	3	\$90,000	3	\$90,000	1	\$30,000
Service Trucks										
Supervisory Cars										
Communications Equipment										
Transceivers			2	2,400	3	3,600	3	3,600	1	1,200
Mobile Units @ \$1,200										
Passenger Shelters										
Bus Stop Signs										
Benches										
Fare Collection Equipment			2	600	3	900	3	900	1	300
Boxes @ \$300										
Counters										
Garage										
Building Acquisition Equipment										
Passenger Terminal										
Contingency 10%				6,300		9,450		9,450		3,150
Total		0		\$69,300		\$103,950		\$103,950		\$34,650

Table 5-3

Sequential Plan Operating Statistics
Years 1 Through 5

Excludes Demand-Responsive Service

Year	1	2	3	4	5
Weekday Route Miles	78.3	102.9	118.5	125.0	125.0
Daily Revenue Miles	3,344.0	4,033.0	4,470.0	4,651.0	4,651.0
Annual Revenue Miles	923,054.0	1,113,108.0	1,233,720.0	1,283,676.0	1,283,676.0
Number of Buses in Operation ¹	24	28	31	32	32
Small	12	16	19	20	20
Large	12	12	12	12	12
Annual Hours of Operation	78,936	94,392	102,120	105,984	105,984
Assumed Ridership					
Average Weekday	5,143	5,970	6,563	6,924	7,102
Annual	1,419,468	1,647,720	1,811,388	1,911,042	1,960,152
Weekday					
Productivity Factor	1.54	1.47	1.46	1.48	1.52
Annual Operating Cost	\$789,360	\$937,460	\$1,071,460	\$1,127,360	\$1,127,360
Administrative Cost	\$50,000	\$50,000	\$50,000	\$50,000	\$50,000
Bonding ²	\$82,500	\$82,500	\$82,500	\$82,500	\$82,500
Total Annual Costs	\$921,860	\$1,069,960	\$1,203,960	\$1,259,860	\$1,259,860
Annual Revenue	\$283,894	\$329,544	\$362,277	\$382,205	\$392,030
Deficit (Total)	\$637,966	\$740,416	\$841,683	\$877,655	\$867,830
Federal Share ³	\$277,733	\$328,958	\$379,591	\$397,577	\$392,665
Suburban Deficit	NA	\$52,671	\$107,490	\$130,017	\$127,345
Suburban Share ⁴	NA	\$26,336	\$53,745	\$65,008	\$63,672
Brockton Deficit	\$360,233	\$358,787	\$354,601	\$350,061	\$347,820
Brockton Share ⁴	\$180,117	\$179,393	\$177,301	\$175,031	\$173,910

*NA = Not Applicable

1. Excludes spares

2. Does not qualify for federal funds

3. 50 percent of deficit excluding bonding

4. 50 percent Federal, 25 percent State, 25 percent Local

Table 5-4

Demand-Responsive Costs - By Town

Year 5

	Brockton	Avon	Abington	Easton	Bridgewater	W. Bridg.	Stoughton	Whitman
Average Weekday Bus Hours	28	14	14	14	14	14	14	14
Average Saturday Bus Hours	14	7	7	7	7	7	7	7
Annual Bus Hours	7,600	3,800	3,800	3,800	3,800	3,800	3,800	3,800
Average Fair	.35	.35	.35	.35	.35	.35	.35	.35
Assumed Origins/Hour	15	8	7	7	7	6	8	7
Assumed Annual Ridership	114,000	30,400	26,600	26,600	26,600	22,800	30,400	26,600
Annual Revenue	\$39,900	\$10,600	\$9,300	\$9,300	\$9,300	\$8,000	\$10,600	\$9,300
Annual Operating Cost (\$11.50/Hr.)	\$87,400	\$43,700	\$43,700	\$43,700	\$43,700	\$43,700	\$43,700	\$43,700
Annual Deficit	\$47,500	\$33,100	\$34,400	\$34,400	\$34,400	\$35,700	\$33,100	\$34,400
Town Share 25%	\$11,900	\$8,300*	\$8,600*	\$8,600*	\$8,600*	\$8,900*	\$8,300*	\$8,600*

*Federal funds may not be available for demand-responsive service outside of the urban area unless fixed route service connects it to the urban area



6.0 IMPLEMENTATION OF THE TRANSIT PROGRAM



6.0 IMPLEMENTATION OF THE TRANSIT PROGRAM

As briefly discussed in the management section, the real issue after the completion of this study will be the implementation of the recommended service. Without effective steps being taken towards its implementation, the entire effort of developing a plan and meeting with the public and local officials will have been wasted.

6.1 Marketing the Transit Program

The marketing program conducted by the Administrator of BAT will be one of his most important functions, and critical to the success of the transit program. Two major efforts which must be developed, initiated, and continuously managed to improve transit service are an effective information system and an effective promotional program.

These programs must be conducted in conjunction with effective and efficient bus service. If the system operates with clean buses, courteous drivers, low fares, on schedule, and with an effective information system and promotional program, ridership will increase.

Information System

Following is a list of the elements forming the basis of an effective information system:

Comprehensive Transit Map: This is a detailed street map of the entire area served by BAT and should identify all transit routes including local and long haul. Copies of the maps should be widely distributed to individuals and to all public places served by transit.

Schematic System Map: This is a map of the entire transit network with a minimal amount of detail so it can be printed on small pocket-size paper (the amount of detail would make the comprehensive transit map too large and cumbersome to carry). Copies of the pocket maps should be available to all area residents.

Schedules: Timetables indicating departure time from the origin, and possibly intermediate stops of each route must be available to all area residents. Schedules should note all variations in service including weekend versus weekday service.

Bus Stop Signs: Signs should be provided to allow patrons to identify places to board a bus and should indicate the various bus routes passing that stop.

Telephone Information Service: An information operator should be provided to give specific information on schedules and routings of all service in the area. The operator should be capable of receiving and routing complaints as well as mailing information to those requesting it.

Shelters: Bus shelters identify points at which buses may be boarded just by their very existence. They provide ideal locations for displaying route maps and schedules, including large copies of the schematic maps.

Promotion

Following are the recommendations for the promotion of transit service:

Commercial Firms: It is recommended that commercial firms such as retail stores provide an incentive program to encourage clients and shoppers to utilize bus service to and from their establishments. The bus driver should be provided with a group of bus ride receipts which could be given to shoppers. After shopping in a particular store, the shopper should then have the opportunity to have his receipt validated at the store office. The validation should state the name of the store, the date, and the time on the back of the receipt. The shopper could then use the validated receipt for a free bus ride. The bus operator would collect the validated receipts, turn them in to BAT, which in turn would bill the commercial firm for the fares, probably at a reduced rate.

Employers: Employers should have the opportunity to purchase a monthly pass or ticket book at a reduced rate, and give or sell that pass or ticket book to its employees to encourage them to use bus service to their place of work.

Newspaper Coupons: The Chamber of Commerce should be encouraged to work with BAT in promoting retail sales and special events in the Brockton area by printing free bus ridership coupons in the local newspaper. The bus passenger would then use the coupon for a free bus fare. The operator would return the coupons to BAT which would bill the Chamber of Commerce for the coupons at a reduced rate.

Occasional Changes in Fare Structure: Although it is not recommended that BAT adopt a no fare structure in the area, it is recommended that BAT consider using a no fare system on new routes or changes in routes to encourage patronage. Further, it is recommended that occasionally BAT make a specific route no fare and advertise it as part of the promotional program. A no fare structure for short periods of time does encourage increased ridership, and if BAT and the operator provide efficient and adequate transit service, there is an increased probability of not only encouraging patronage for the demonstration, but keeping it after the completion of the demonstration.

A more complete discussion of marketing is provided in Staff Paper No. 9, "Guidelines for Developing a Transit Information System in the Brockton Area" which is included as Appendix N.

6.2 Future Steps

In addition to working toward implementation of the first year of the program, there are a number of other steps which must be taken to implement the total plan. Following is a brief discussion of these future steps:

1. It will be necessary to conduct an engineering and architectural feasibility study for the purchase or construction of a storage and maintenance facility.
2. It is recommended that an engineering and architectural feasibility study be conducted for the development of a permanent downtown multi-modal passenger facility.
3. It will be necessary for BAT to continually monitor the service provided and the impact of the service on the public (i.e., to analyze the ridership on the changed service). Through this monitoring process, the BAT staff in cooperation with the OCPC staff, should consider any changes in this development program.
4. BAT and OCPC should continue to meet with local officials to keep them apprised of the service being provided and the ridership levels being obtained. There should be a continual program by the staff to encourage local communities to become members of BAT and to provide service especially to the individuals within the community who have no other form of transportation.



7.0 SOCIAL & ENVIRONMENTAL CONSEQUENCES



7.0 SOCIAL AND ENVIRONMENTAL CONSEQUENCES

Every improvement which is made in providing improved bus service in the area will have an impact on the public and on the environment. The question which must be addressed is whether the consequences have negative or positive impacts and if negative, are they outweighed by positive impacts.

7.1 Social Consequences

There are no negative social consequences in providing urban transit service, except that it is the society in general which provides the subsidy funds for operating the service, and some members of society might feel that public agencies should not provide any subsidy funds for bus service.

A positive consequence is improved accessibility to the public. Many individuals who need bus service and even those persons who would prefer not to use their cars would have access to places of employment, shopping facilities, and recreational activities which were inaccessible in the past. In some instances, this accessibility could be extremely significant to life-style, especially if an individual is unemployed and on welfare, and has the opportunity to accept a job and become part of the productive sector of society.

The buses which will be on the road in increased numbers are larger than cars and will have an impact on traffic congestion on busy streets; however, the bus ridership, in effect, should reduce automobile travel on the same city streets. Further, a special effort has been made to recommend smaller vehicles in urban service in order not to overly congest city streets and to make the buses more maneuverable on narrow streets.

7.2 Environmental Consequences

The only adverse environmental effect of these recommendations is that there will be more buses on the road, especially in the downtown Brockton area, than there are at present. Today, there are nine buses traveling at any one time. With this recommended system, in the first year there will be 23 buses traveling.

There are a number of positive environmental effects of these recommendations and they are:

1. New buses will be quieter and less polluting than the present buses.
2. The new buses will be able to travel through town at a faster speed, making them more efficient.
3. The new buses will be more aesthetically attractive than the present buses.
4. As the new system encourages ridership, and ridership increases on the routes, there will be less automobile travel in the city, therefore less automobile pollution.
5. The bus terminal at the parking lot east of Plymouth Home-National Bank will eliminate some traffic congestion on Main and School Streets.



8.0 OTHER TRANSPORTATION NEEDS



6.0 OTHER TRANSPORTATION NEEDS

In the process of conducting this transit study and producing the Transit Development Program, a number of other transportation needs were considered. Most of these needs will require further investigation and analysis before steps toward implementation take place. Following is a description of each issue addressed.

8.1 Rail Service to Easton

Presently there are two trains in the morning peak period from the Stoughton Station to South Station in Boston, and two trains back in the evening. The surveys conducted on the trains showed approximately 400 passenger trips per day, using the service in both directions with most trips being made to and from work. It has been recommended that the Brockton-Stoughton bus service be scheduled so that it will meet the trains both inbound and outbound, thus providing an additional form of transportation to residents of the area.

There has been interest from some residents of Easton in extending rail service from the Stoughton Station to Easton. Such an extension of service with an additional station located in Easton would provide additional station parking. Improved bus service from the center of Brockton to Easton would provide additional bus service to the rail station.

It is recommended that a more detailed feasibility study be conducted during the first year of the improvement program to determine the feasibility of providing rail passenger service to Easton.

8.2 Boston to Cape Cod Rail Service

The state administration appears interested in bringing back rail service from the Boston area to Cape Cod. A number of railroad rights-of-way have been considered in the development of that service. One alternative being considered is the improvement of the rail facility through the center of Brockton. This service improvement will not only carry passengers from the Cape area to Boston, but would add improved rail service from Brockton and the whole rail corridor to Boston. This corridor should be looked at in considerably more detail and the OCPC staff should play a major role in the review.

8.3 Interchange Parking

The state has been involved in a program to develop interchange parking lots to encourage carpooling throughout the state. There are a number of interchanges on Route 24 in the Brockton area which should be considered for interchange parking. The further analysis of these areas as fringe parking lots should give consideration not only to carpooling at the lots, but to the possibility of providing public transit service to and from the lots.



APPENDIX

APPENDIX

- A. List of BATS Publications
- B. Transit Priority List
- C. List of Firms
- D. On Board Bus Survey Form
- E. Home Interview Survey Form
- F. Attitude Survey Form
- G. Elderly Survey Form
- H. Spanish Survey Form
- I. Special Interest Group Transportation Survey Forms
- J. Logo Contest Handout
- K.* Staff Paper #4 - Estimate of Future Ridership
- L.* Table from Staff Paper #5 - Analysis of Alternative Plans
- M.* Staff Paper #6 - Survey of Rail Passenger Service
- N.* Staff Paper #9 - Guidelines for Developing a Transit Information System
in the Brockton Area

* Not included in reports for general distribution. Available on request



APPENDIX A

List of BATS Publications

Technical Memos

TM #1	Analysis of Past and Present Service
TM #2	Analysis of Surveys
TM #3	Financial and Equipment Analysis
TM #4	Sequential Development Plan

Staff Papers

SP #1	Mail-Out Attitude/Latent Demand Survey
SP #2	Bus Passenger Survey
SP #3	Home Interview Survey
SP #4	Estimate of Future Ridership
SP #5	Analysis of Alternative Plans
SP #6	Survey of Rail Passenger Service
SP #7	Socio-Economic Factors Affecting Transit
SP #8	Final Recommendations-Brockton Area Bus Routes
SP #9	Guidelines for Developing a Transit Information System in the Brockton Area
SP #10	Investigation of Potential Terminal Sites
SP #11	Specialize Transportation Services

Public Information

PI #1	Transit Priority List
PI #2	Transit Recommendations for the Old Colony Towns
PI #3	Preliminary Recommendations
PI #4	Summary of BATS Recommendations
TDP	TRANSIT DEVELOPMENT PROGRAM

BROCKTON AREA TRANSIT STUDY
OLD COLONY PLANNING COUNCILTRANSIT PRIORITY LIST

This Transit Priority List was produced by the BATS Steering Committee at meetings of August 13, 1974 and November 19, 1974 and revised as a result of meetings held with representatives of the limited income and minorities on December 4, 1974 and of the elderly on December 6, 1974.

1. Identify key locations of potential transit ridership and respond with the provision of transit service.
2. Provide a transit service with compatible scheduling that allows for transferring from one carrier to another at certain set stations such as parking lots and small terminals.
3. Obtain dependable, reliable, and appropriate vehicles for the new transit system.
4. Consider an expanded weekly period of transit operations such as a seven day a week service that would allow for special weekend trips such as church services and hospital visits.
5. Establish a well-developed promotion campaign to encourage ridership while maintaining an easily accessible source of transit information employing newspapers, radio, etc. A centralized information source should be established with routing information, time schedules, etc.
6. Provide a Regional Transit Service that would get people to work with special attention to the needs of those with limited incomes.
7. Provide transportation to the region's industrial parks and other locations of high employment.
8. Seek the interests of local large employers in coordinating with the transit service through supplemental services such as van pooling or shuttle services.
9. Address the transit needs of those elderly citizen groups that live in the region's housing projects and those not living in housing projects but in private homes.
10. Provide transportation for citizens between the region's town centers with a limited frequency service. For example: between the Avon Center to downtown Brockton four times a day.
11. Establish a permanent terminal in downtown Brockton.

BROCKTON

MALL OR SMALL PLAZA LOCATION

NAME OF FIRM

- (1) South Main - After Hayward Avenue
- (2) Westgate Mall - Oak or Pleasant Streets
- (3) West Side Shopping Center - Belmont Street
- (4) Crescent Street Shopping Center - Crescent Street
- (5) Eastway Shopping Plaza - Centre Street
- (6) Carey Hill Plaza - East Ashland & Carey Streets
- (7) Oak Village - Oak Street
- (8) Southgate Plaza - Across from Thayer Avenue
- (9) Crescent Street Plaza - Crescent Street

Source of SIC and Employment Data - Mass. Department of Employment Security

APPENDIX C (CONT.)

BROCKTON FIRMS WITH 50 OR MORE EMPLOYEES

	<u>NAME OF FIRM</u>	<u>TYPE</u>	<u>ADDRESS</u>	<u>SIC</u>	<u>SIZE</u>
1.	Gerald J. Kelleher	Ind.	92 Meadow Lane	1510	50-99
2.	Ashland Oil Inc.	Ind.	430 Howard Street	1610	250-499
3.	Norris Industry Inc.	Ind.	1123 Pearl Street	1999	100-249
4.	Howard Johnson	Ind.	Oak & Battle Streets	2037	100-249
5.	Producers Dairy	Ind.	Belmont Street	2026	100-249
6.	Washburn Candy	Ind.	137 Perkins Avenue	2071	50-99
7.	Garland Mills	Ind.	Oak Street	2253	500-999
8.	Brief Originals	Ind.	Manley Street	2335	100-249
9.	South Shore Sportswear	Ind.	20 Clifton Avenue	2337	50-99
10.	Davis Clothing	Ind.	115 Westgate Drive	2311	50-99
11.	N. E. Mackintosh	Ind.	46 North Montello Street	2337	50-99
12.	Brockton Dress	Ind.	70 Centre Street	2335	50-99
13.	Piccento Sportswear	Ind.	93 Centre Street	2339	50-99
14.	Fisher Sportswear	Ind.	148 Court Street	2331	50-99
15.	Mayflower Coat	Ind.	948 Main Street	2385	50-99
16.	Lewiston Inc.	Ind.	52 Haverhill Street	2337	50-99
17.	Charles Barnhart	Com.	525 Belmont Street	5810	50-99
18.	Breens Inc.	Com.	310 Copeland Street	5810	50-99
19.	Parkway Restaurant	Com.	310 Oak Street	5810	50-99
20.	Plymouth-Home National Bank	Com.	74 School Street	6020	100-249
21.	Gino of Italy	Com.	691 Warren Avenue	7230	50-99
22.	Dunkin Donuts	Com.	Montello Street	7390	} 100-249
22B	Dunkin Donuts	Com.	Oak & Pearl Streets	7390	
23.	Quincy Adams Nursing Home	Ser.	130 Quincy Avenue	8090	100-249
24.	Greater Brockton Homemakers	Ser.	232 Main Street	8090	100-249

BROCKTON FIRMS WITH 50 OR MORE EMPLOYEES

	<u>NAME OF FIRM</u>	<u>TYPE</u>	<u>ADDRESS</u>	<u>SIC</u>	<u>SIZE</u>
25.	Shields Management	Ind.	1330 Main Street	8090	50-99
26.	Fay Nursing Home	Ser.	947 North Main Street	8090	50-99
27.	Michael Jay	Ind.	70 Center Street	2339	50-99
28.	Lounge Inc.	Ind.	255 Libby Street	2512	50-99
29.	Claff & Sons	Ind.	506 North Warren Avenue	2652	100-249
30.	Brockton Enterprise	Ind.	60 Main Street	2711	250-499
31.	Vulcan Corp.	Ind.	Oak Hill Drive	3079	100-249
32.	Egan De Young	Ind.	1614 Main Street	3079	50-99
33.	George E. Keith	Ind.	100 Perkins Avenue	3141	500-999
34.	Knapp King Size	Ind.	1 Knapp Center	3141	250-499
35.	Potvin Shoe	Ind.	22 Station Avenue	3141	250-499
36.	Footjoy	Ind.	144 Field Street	3141	250-499
37.	Barbour Welting	Ind.	932 North Montello St.	3131	100-249
38.	B & B Tanning	Ind.	101 Belmont Street	3131	50-99
39.	Mutron Corp.	Ind.	646 Summer Street	3679	50-99
40.	Stall & Dean Mfg. Co.	Ind.	95 Church Street	3949	50-99
41.	Crocker Transportation	Ind.	488 Main Street	4510	50-99
42.	Quinn Freight Lines	Ind.	1039 North Montello	4210	250-499
43.	Bourne Transportation	Ind.	1029 Pearl Street	4210	50-99
44.	Northhampton Gas & Light	Ind.	995 Belmont Street	4920	250-499
45.	Brockton Taunton Gas Co.	Ind.	995 Belmont Street	4920	250-499
46.	Brockton Edison Co.	Ind.	36 Main Street	4910	250-499
47.	Eaton Shoe	Ind.	147 Centre Street	5030	100-249
48.	Mullare News Agency	Ind.	22 Court Avenue	5090	50-99

BROCKTON FIRMS WITH 50 OR MORE EMPLOYEES

<u>NAME OF FIRM</u>	<u>TYPE</u>	<u>ADDRESS</u>	<u>SIC</u>	<u>SIZE</u>
49. Colonial Liquors	Ind.	1933 Main Street	5090	50-99
50. LeBaron Foundry	Ind.	14 East Union Street	3321	50-99
51. Waid Machine Co.	Ind.	966 Main Street	3451	50-99
52. Technology Engineering Co.	Ind.	71 Forest Street	3443	50-99
53. George Knight	Ind.	54 Lincoln Street	3559	50-99
54. Alden Products	Ind.	117 North Main Street	3679	100-249
55A BPM East	Com.	Centre Street	5410	250-499
55B BPM West	Com.	Belmont Street	5410	
55C BPM South	Com.	South Main Street	5410	
56. Christy's Market	Com.	400 North Main Street	5410	50-99
57. Christo's	Com.	712 Crescent Street	5810	100-249
58. Tip Top Tap	Com.	365 North Main Street	5810	50-99
59. Mutual Oil Co.	Ind.	863 Crescent Street	5540	50-99
60. York Steak House	Com.	Westgate Drive	5810	100-249
61A Ganley's Inc.	Com.	234 Main Street	5650	50-99
61B Ganley's Inc.	Com.	West Shopping Plaza	5650	
62A Burger King East	Com.	Crescent Street	5810	50-99
62B Burger King West	Com.	Belmont Street	5810	
63. Kennedy's	Com.	Westgate Mall	5650	50-99
64. Gilchrist	Com.	Westgate Mall	5310	100-249
65. Touraine's	Com.	Westgate Mall		
66. Bradlee's	Com.	Westgate Mall		100-249
67A Woolworth's Westgate	Com.	Westgate Mall	5330	100-249
67B Woolworth's East	Com.	Crescent Street	5330	
68. Phoenix Beverage	Ind.	138 Elliot Street	5090	
69. Channa Inc.	Com.	908 North Montello St.	5810	50-99

APPENDIX C (CONT.)

BROCKTON FIRMS WITH 50 OR MORE EMPLOYEES

<u>NAME OF FIRM</u>	<u>TYPE</u>	<u>ADDRESS</u>	<u>SIC</u>	<u>SIZE</u>
70. Brockton Wholesale Beverage	Ind.	20 North Montello St.	5090	50-99
71. King Size	Com.	24 Forest Street	5320	250-499
72. Eleganza	Com.	1100 Pearl Street	5320	100-249
73. Mammoth Mart East	Com.	Crescent Street	5310	100-249
74. Sears	Com.	Belmont Street	5310	250-499
75. King's	Com.	West & Torrey Streets	5310	100-249
76. Zayre's	Com.	120 North Main Street	5330	100-249
77. Brockton Hospital	Ser.	680 Center Street		
78. Braemoor Nursing Home	Ser.	34 North Pearl Street	8090	50-99
79. YMCA	Ser.	320 Main Street	8640	50-99
80. YWCA	Ser.	465 Main Street	8640	50-99
81. Hessie Easton	Ind.	1123 Pearl Street		
82. Wind Innersole	Ind.	15 Rutland Square		
83. Wind Speciality	Ind.	7 Sylvan Street		
84. Superior Baking	Com.	176 Warren Avenue		
85. Leo Mac Iver Co. Inc.	Ind.	75 Ames Street		
86A Fernandes North	Com.	Oak Street	5410	
86B Fernandes South	Com.	South Main Street	5410	
86C Fernandes East	Com.	Crescent Street	5410	
87A Stop & Shop	Com.	Westgate Mall	5410	100-249
87B Stop & Shop	Com.	Crescent Street	5410	
88 First National	Com.	Torrey Street		
89A A&P West	Com.	Belmont Street		
89B A&P South	Com.	Main Street		

BROCKTON FIRMS WITH 50 OR MORE EMPLOYEES

	<u>NAME OF FIRM</u>	<u>TYPE</u>	<u>ADDRESS</u>	<u>SIC</u>	<u>SIZE</u>
90.	Purity Supreme	Com.	North Carey & East Ashland		
91.	Stuarts	Com.	North Carey & East Ashland		
92.	Big G	Com.	South Main Street		
93.	K Mart	Com.	South Main Street		
94.	Bradlees	Com.	Crescent Street		
95.	Melville Shoe	Ind.	67 Millwork Street	5030	100-249
96.	First County National Bank	Com.	90 Main Street	6020	100-249
97.	Goddard Medical Associates	Ser.	1 Pearl Street	8090	100-249
98.	Self-Help, Inc.	Ser.	196 Main Street	8670	100-249
99.	Capeway Manor Restaurant	Com.	1507 Main Street	5810	50-99
100.	Cardinal Cushing Hospital	Ser.	235 North Pearl Street		
101.	Multi-Service Health Center	Ser.	165 Quincy Street		
102.	V.A. Hospital	Ser.	940 Belmont Street		

ABINGTON

	<u>NAME OF FIRM</u>	<u>TYPE</u>	<u>ADDRESS</u>	<u>SIC</u>	<u>SIZE</u>
1.	Abington Inc.	Ind.	200 Wales Street	3552	50-99
2.	Olsen Machine & Tool Co.	Ind.	225 Wales Street		
3.	Rumford Litho Inc.	Ind.	380 North Avenue	2752	50-99
4.	N. E. Art Publishers	Ind.	10 Railroad Street	2771	50-99
5.	Alger Corp.	Ind.	477 Washington Street	3131	50-99
6.	Andrew & Pierce	Ind.	1431 Bedford Street	4210	100-249
7.	Noonan Transportation	Ind.	118 Monroe Street	4210	50-99

APPENDIX C (CONT.)

AVON

	<u>NAME OF FIRM</u>	<u>TYPE</u>	<u>ADDRESS</u>	<u>SIC</u>	<u>SIZE</u>
1.	Burgess & Blacker	Ind.	Avon Industrial Park	1760	100-249
2.	Avon Sole Co.	Ind.	Spring Street	3069	250-499
3.	Avon Tape Inc.	Ind.	583 Main Street	2241	50-99
4.	Youth World Inc.	Ind.	25 Littlefield Street	5990	50-99
5.	S & J Distributors	Ind.	25 Littlefield Street	5990	50-99
6.	Infant World	Ind.	25 Littlefield Street	5990	50-99
7.	Hermans Inc.	Ind.	Avon Industrial Park	5020	100-249
8.	Globe Tool & Gage Works Inc.	Ind.	Avon Industrial Park	3544	50-99
9.	Steel Span Inc.	Ind.	Avon Industrial Park		
10.	Lifetime Corp.	Ind.	Avon Industrial Park		
11.	Lorell Press	Ind.	Avon Industrial Park	2751	50-99
12.	Waldoroth Label Corp.	Ind.	Avon Industrial Park		
13.	Chapman Manufacturing	Ind.	401 West Main Street	3642	50-99
14.	Hermetite Corp.	Ind.	100 Ladge Drive	3674	250-499
15.	Cape Cod Overland Express Inc.	Ind.	Ladge Drive		
16.	Peterson & Sons	Ind.	491 West Main Street		
17.	American Shoe Shank	Ind.	53 East Main Street	3131	50-99
18.	Brockton Cutting Die & Machine Co.	Ind.	Memorial Drive		
19.	Fidelity Prestige Products	Ind.	Avon Industrial Park		
20.	Mass Engineering	Ind.	Avon Industrial Park		
21.	Kiddie Products Inc.	Ind.	1 Kiddie Drive		
22.	Federico Co.	Ind.	Box 162	1620	100-249
23.	Bay State Structural	Ind.	Box 515	5090	50-99

BRIDGEWATER

	<u>NAME OF FIRM</u>	<u>TYPE</u>	<u>ADDRESS</u>	<u>SIC</u>	<u>SIZE</u>
1.	Bridgewater Foundry Co.	Ind.	Off High Street	3321	50-99
2.	Bridgewater Shoe Corp.	Ind.	42 Spring Street	3141	50-99
3.	Independent Nail	Ind.	106 Hale Street		
4.	George O. Jenkins Co.	Ind.	120 High Street	2631	50-99
5.	George E. Keith	Ind.	31 Perkins Street		
6.	The Henry Perkins Co.	Ind.	Broad Street	3321	50-99
7.	Stiles & Hart Brick	Ind.	Cook Street		
8.	Grants	Com.	College Plaza	5330	100-249
9.	Fernandes	Com.	College Plaza		
10.	McIntire Dairy	Com.	792 Plymouth Street	5450	50-99

EAST BRIDGEWATER

	<u>NAME OF FIRM</u>	<u>TYPE</u>	<u>ADDRESS</u>	<u>SIC</u>	<u>SIZE</u>
1.	B.P.M.	Com.	140 Laurel Street		
2.	Brown E. Norris Co.	Ind.	58 South Washington Street		
3.	Foxboro Company	Ind.	600 North Bedford Street	3821	500-999
4.	Murray Carver	Ind.	15 Whitman Street		
5.	Hallmark Nursing Home	Ser.	66 Central Street	8090	100-249
6.	Fernandes Super Market	Com.	Bedford Street		

APPENDIX C (CONT.)

EASTON

<u>NAME OF FIRM</u>	<u>TYPE</u>	<u>ADDRESS</u>	<u>SIC</u>	<u>SIZE</u>
1. Belcher Malleable Iron, Co.	Ind.	558 Foundry Street		
2. Crofoot Gear Corp.	Ind.	20 Central Street	3564	50-99
3. Steadfast Rubber Co.	Ind.	50 Oliver Street	3131	100-249
4. MerryMac Inc.	Com.	310 Turnpike Street	5810	50-99
5. Eastern Lincoln Nursing	Ser.	184 Lincoln Street	8090	50-99
6. Intercity Transportation	Ind.	600 Turnpike Street	4210	100-249
7. Fernandes	Com.	Main Street	5410	50-99

HANSON

<u>NAME OF FIRM</u>	<u>TYPE</u>	<u>ADDRESS</u>	<u>SIC</u>	<u>SIZE</u>
1. Ocean Spray	Ind.	Main Street	2033	250-499
2. BPM	Com.	Route 14		

PEMBROKE

<u>NAME OF FIRM</u>	<u>TYPE</u>	<u>ADDRESS</u>	<u>SIC</u>	<u>SIZE</u>
1. Hyer Industries/ Thayer Scale Div. (Cutler Hammer)	Ind.	Schooseet Street	3576	50-99
2. Deerskin Trading Post	Com.	Routes 3 and 139	5650	50-99

STOUGHTON

	<u>NAME OF FIRM</u>	<u>TYPE</u>	<u>ADDRESS</u>	<u>SIC</u>	<u>SIZE</u>
1.	Edward Gill	Com.	138 Plain Drive	1510	50-99
2.	Stoughton Elastic Web. Co. Inc.	Ind.	49 Rose Street	2299	100-249
3.	Dello Sportswear	Ind.	630 Spark Street	2339	50-99
4.	Stoughton Restaurant	Com.	653 Washington Street	5810	50-99
5.	Dietz Enterprises	Com.	418 Washington Street	5810	50-99
6.	Stoughton Dairy Fair	Com.	1025 Central Street	5910	100-249
7.	Brookfield Engineering Labs	Ind.	240 Cushing Street	3821	50-99
8.	Franklin Sportswear	Ind.	17 Campanelli Parkway	3941	50-99
9.	Simone Stone Corp.	Ind.	1185 Turnpike Street	3281	100-249
10.	F. C. Phillip Inc.	Ind.	473 Washington Street	3451	100-249
11.	Quality Steel Products	Ind.	Pleasant Street	3499	50-99
12.	Mammoth Mart Inc.	Com.	Pearl Street	5310	50-99
13.	Roxie's	Com.	525 Washington Street	5420	100-249
14.	Robert Cochrane	Ind.	Canton Street		
15A	American Built Right	Ind.	Washington Street		
15B	American Built Right	Ind.	Winter Street		
16.	Twin-Kee Manufacturing	Ind.	720 Park Street		
17.	Medical Center	Ser.	966 Park Street		
18.	Ark-Les Switch Corp.	Ind.	1466 Central Street		
19.	Alberts	Com.	Washington Street		
20.	Interstate Coach	Ind.	Washington Street		
21.	Grossman's Lumber	Com.	Washington Street		
22.	Goddard Memorial Hospital	Ser.	Sumner Street		

WEST BRIDGEWATER

	<u>NAME OF FIRM</u>	<u>TYPE</u>	<u>ADDRESS</u>	<u>SIC</u>	<u>SIZE</u>
1.	Component Manufacturing Service Inc.	Ind.	1 Component Street	3674	250-499
2.	Wood-Hu Kitchens, Inc.	Ind.	343 Manley Street	2511	100-249
3.	Cape Dory Co.	Ind.	773 Crescent Street	3732	50-99
4.	Mammoth Mart Offices	Ind.	321 Manley Street	5310	50-99

WHITMAN

	<u>NAME OF FIRM</u>	<u>TYPE</u>	<u>ADDRESS</u>	<u>SIC</u>	<u>SIZE</u>
1.	Coburn-Wilbert Vault Co.	Ind.	10 Buckley Avenue	3281	100-249
2.	Crown Container Corp.	Ind.	20 Pond Street		
3.	D. B. Gurney Co.	Ind.	746 Washington Street	3315	50-99
4.	Kayser-Roth Shoe	Ind.	Marble Street		
5.	USM Corp.	Ind.	98 Myrtle Street		
6.	Whitman Foundry, Inc.	Ind.	40 Raynor Avenue	3321	50-99
7.	Saccones Toll House	Com.	326 Bedford Street	5810	50-99
8.	Whitman Management Corp.	Ind.	146 South Street	8090	50-99
9.	Standard Products Corp.	Ind.	68 Temple Street	3634	50-99
10.	Carey Motor Transportation	Ind.	305 Temple Street	4210	100-249

BROCKTON AREA TRANSIT STUDY

Dear Bus Rider:

This survey of bus riding is being conducted in order to plan for better service in the Brockton area. Your assistance will provide essential information for this study. Please take a few minutes to complete this survey and return it to the study representative or driver. Your cooperation in this important survey is appreciated.

This study is being conducted by the Old Colony Planning Council and the City of Brockton in cooperation with the U.S. Department of Transportation.

BUSINESS REPLY MAIL
 NO POSTAGE STAMP NECESSARY IF MAILED IN THE UNITED STATES

- POSTAGE WILL BE PAID BY -

OLD COLONY PLANNING COUNCIL

232 MAIN STREET

BROCKTON, MASS. 02401

1. WHERE DID YOU START THIS TRIP?
(before boarding bus) give nearest street intersection town2. WHERE ARE YOU GOING?
(after leaving bus) give nearest street intersection town

3. HOW DID YOU GET TO THE BUS STOP. (PLEASE CHECK ONE)

- 1 ☐ Walked less than 1 block 4 ☐ Driven to the stop
 2 ☐ Walked 1-3 blocks 5 ☐ Drove to the stop and parked
 3 ☐ Walked 4 blocks or more 6 ☐ Other

4. WHAT IS MAIN PURPOSE OF YOUR TRIP? (PLEASE CHECK ONE)

- 1 ☐ Work 3 ☐ School 5 ☐ Social Activity ☐ Other
 2 ☐ Shopping 4 ☐ Medical 6 ☐ Recreational Activity

5. AFTER LEAVING BUS, HOW WILL YOU GET TO YOUR FINAL DESTINATION? (CHECK ONE)

- 1 ☐ Walk less than 1 block 4 ☐ Automobile
 2 ☐ Walk 1-3 blocks 5 ☐ Taxi
 3 ☐ Walk 4 blocks or more 6 ☐ Bus

6. DO YOU HAVE A DRIVER'S LICENSE? 1 ☐ Yes 2 ☐ No

7. HOW MANY AUTOMOBILES ARE AVAILABLE IN FAMILY:

8. IF YOU HAVE A LICENSE, WAS AN AUTOMOBILE AVAILABLE FOR YOUR USE? 1 ☐ Yes 2 ☐ No

9. HOW OFTEN DO YOU TAKE THE BUS? (PLEASE CHECK ONE)

- 1 ☐ Daily 2 ☐ 1-2 times a week 3 ☐ Other

10. AGE: 1 ☐ Under 14 3 ☐ 20 - 24 5 ☐ 35 - 64
2 ☐ 15 - 19 4 ☐ 25 - 34 6 ☐ 65 or over11. SEX: 1 ☐ Male 2 ☐ Female

AFTER COMPLETION OF THIS CARD, GIVE IT TO THE DRIVER OR DROP IN ANY U.S. MAIL BOX

THANK YOU.

Home Interview

Interviewer _____

CALLS

DATE _____ TIME _____

- (1) _____
 (2) _____
 (3) _____
 (4) _____

REPORT SUBMITTED INCOMPLETE

Date _____

Reason _____

Supervisor's comment _____

Report completed _____ (Date) _____ (Initial)

Interviews edited (initial) _____ (date) _____

Coded by (initial) _____ (date) _____

Coding Checked by (initial) _____ (date) _____

Sample No. _____

Interviewee Name _____

Address _____

Town _____

Telephone No. _____

Day of Interview _____

Interview Type

- 1 Vacant
 2 Good
 3 Incomplete



Sample No. 1 Traffic Zone

Date of Travel month day year day of week

1. Structure Type 7 Other
- 1 Single Family 4 Trailer Court
- 2 Two or Three Family 5 Individual Trailer
- 3 Multi-Family 6 Institution (Group Quarters)

2. Type of Living Quarters Group Quarters
- 1 House Housing Unit 3 Permanent Room 5 Medical 8 Military
- 2 Apt./Condo. 4 Transient Room 6 Church 9 Rooming/Boarding
- 7 College 0 Other Inst.

3. Total number of persons living in this dwelling unit

4. Number of persons 5 years old and older living in this dwelling

5. Number of persons 16 years and older living in this dwelling

6. Number of persons with driver's license

7. Number of bus trips made (by all members)

8. How many blocks to nearest bus stop

9. How many automobiles are available for family use

10. What is the range of your annual family income

1 0-4,999 4 10,000-14,999

2 5,000-7,999 5 15,000-19,999

3 8,000-9,999 6 20,000 and over

Marital Status			
S-Single	M-Married	W-Widowed	D-Divorced or Separated

Current Work Status			
E-Employed	U-Unemployed	R-Retired	O-Other

A	B	C	D	E	F	G	H
Persons by Relationship to Head	Person Number	Sex	Age	Married Work Status	Current Work Status	Driver's License	Total Number of Trips
Head of Housing Unit	01						
	02						
	03						
	04						
	05						
	06						
	07						
	08						
	09						
	10						
	11						
	12						

TRIP REPORT

SAMPLE NO. 2

Month, Day and
Day of Week of Travel

SHEET OF

1	2	3	4	5	6	7	8	9	10	11
Peterson No.	Trip No.	Where did this trip begin? (Origin)	Where did this trip end? (Destination)	Mode of travel	Time Starting	Purpose of trip From To	Lead use at	City	How long did it take to get to the city?	Kind of parking
		City	City	1 Auto driver 2 Auto pass. 3 Street-car 4 Taxi pass. 5 Truck pass. 6 Walk to work (list)	A.M. P.M.	1 Work 2 Shopping 3 School 4 Medical Services 5 Social Activity 6 Rec. Activity 7 Other 8 Service Passenger 9 Home	Origin Dest.	1 Yes 2 No	1 Street free 2 Street meter 3 Lot free 4 Lot paid 5 Garage free 6 Garage paid 7 Service or repairs 8 Res. property 9 Guided 0 Not parked	
		City	City	1 Auto driver 2 Auto pass. 3 Street-car 4 Taxi pass. 5 Truck pass. 6 Walk to work (list)	A.M. P.M.	1 Work 2 Shopping 3 School 4 Medical Services 5 Social Activity 6 Rec. Activity 7 Other 8 Service Passenger 9 Home	Origin Dest.	1 Yes 2 No	1 Street free 2 Street meter 3 Lot free 4 Lot paid 5 Garage free 6 Garage paid 7 Service or repairs 8 Res. property 9 Guided 0 Not parked	
		City	City	1 Auto driver 2 Auto pass. 3 Street-car 4 Taxi pass. 5 Truck pass. 6 Walk to work (list)	A.M. P.M.	1 Work 2 Shopping 3 School 4 Medical Services 5 Social Activity 6 Rec. Activity 7 Other 8 Service Passenger 9 Home	Origin Dest.	1 Yes 2 No	1 Street free 2 Street meter 3 Lot free 4 Lot paid 5 Garage free 6 Garage paid 7 Service or repairs 8 Res. property 9 Guided 0 Not parked	
		City	City	1 Auto driver 2 Auto pass. 3 Street-car 4 Taxi pass. 5 Truck pass. 6 Walk to work (list)	A.M. P.M.	1 Work 2 Shopping 3 School 4 Medical Services 5 Social Activity 6 Rec. Activity 7 Other 8 Service Passenger 9 Home	Origin Dest.	1 Yes 2 No	1 Street free 2 Street meter 3 Lot free 4 Lot paid 5 Garage free 6 Garage paid 7 Service or repairs 8 Res. property 9 Guided 0 Not parked	
		City	City	1 Auto driver 2 Auto pass. 3 Street-car 4 Taxi pass. 5 Truck pass. 6 Walk to work (list)	A.M. P.M.	1 Work 2 Shopping 3 School 4 Medical Services 5 Social Activity 6 Rec. Activity 7 Other 8 Service Passenger 9 Home	Origin Dest.	1 Yes 2 No	1 Street free 2 Street meter 3 Lot free 4 Lot paid 5 Garage free 6 Garage paid 7 Service or repairs 8 Res. property 9 Guided 0 Not parked	

APPENDIX F

This Information Will Be Kept in Strictest Confidence

BROCKTON AREA TRANSIT STUDY

office use only

1. What is your home address?

(Street and Number) (Town) (Zip)

2. How many people in your family over 5 years of age? _____

3. How many people in your family over 65 years of age? _____

4. How many automobiles available to your family? _____

5. How many licensed drivers in your family? _____

6. Please describe all family members who travel to work on a regular basis. (Do not include students working at summer jobs.)

PERSON	AGE	PLACE OF EMPLOYMENT	CURRENT MEANS OF TRAVEL TO WORK
A	<input type="checkbox"/> 16-24 years <input type="checkbox"/> 25-34 years <input type="checkbox"/> 35-64 years <input type="checkbox"/> 65 and over	Address <u>or</u> nearest street intersection and Town name _____ _____	<input type="checkbox"/> CAR <input type="checkbox"/> BUS <input type="checkbox"/> TAXI <input type="checkbox"/> WALK
B	<input type="checkbox"/> 16-24 years <input type="checkbox"/> 25-34 years <input type="checkbox"/> 35-64 years <input type="checkbox"/> 65 and over	Address <u>or</u> nearest street intersection and Town name _____ _____	<input type="checkbox"/> CAR <input type="checkbox"/> BUS <input type="checkbox"/> TAXI <input type="checkbox"/> WALK
C	<input type="checkbox"/> 16-24 years <input type="checkbox"/> 25-34 years <input type="checkbox"/> 35-64 years <input type="checkbox"/> 65 and over	Address <u>or</u> nearest street intersection and Town name _____ _____	<input type="checkbox"/> CAR <input type="checkbox"/> BUS <input type="checkbox"/> TAXI <input type="checkbox"/> WALK
D	<input type="checkbox"/> 16-24 years <input type="checkbox"/> 25-34 years <input type="checkbox"/> 35-64 years <input type="checkbox"/> 65 and over	Address <u>or</u> nearest street intersection and Town name _____ _____	<input type="checkbox"/> CAR <input type="checkbox"/> BUS <input type="checkbox"/> TAXI <input type="checkbox"/> WALK

For more entries write on reverse side. If you did, check here: ☐

7. Is there a bus stop within a 5-minute (1/4 mile) walk of your home? Check one:
- ☐
- yes
- ☐
- no
- ☐
- don't know

8. Is there a bus stop within a 5-minute (1/4 mile) walk of your place of employment?

Check one: Person Yes No Don't know

A	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
B	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
C	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
D	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Please answer the questions on the following pages also.

- 2 -

offline use only

9. If bus/transit service were improved so that it would be possible to catch a bus/transit at least every fifteen minutes, and walking distances to bus/transit stops were five minutes or less, would members of your household use the bus/transit more often?
Check one: ☐ yes ☐ no

2 9

10. If members of your family would use improved bus/transit service, please describe the bus/transit trips they would make. (Indicate only those bus/transit trips not presently made.)

Destination of Bus Trip	Purpose of Trip	Number Of Round Trips Per Week
Address or nearest street intersection and Town name	<input type="checkbox"/> Work <input type="checkbox"/> Social <input type="checkbox"/> Shop <input type="checkbox"/> Recreation <input type="checkbox"/> School <input type="checkbox"/> Other <input type="checkbox"/> Medical	
Address or nearest street intersection and Town name	<input type="checkbox"/> Work <input type="checkbox"/> Social <input type="checkbox"/> Shop <input type="checkbox"/> Recreation <input type="checkbox"/> School <input type="checkbox"/> Other <input type="checkbox"/> Medical	
Address or nearest street intersection and Town name	<input type="checkbox"/> Work <input type="checkbox"/> Social <input type="checkbox"/> Shop <input type="checkbox"/> Recreation <input type="checkbox"/> School <input type="checkbox"/> Other <input type="checkbox"/> Medical	
Address or nearest street intersection and Town name	<input type="checkbox"/> Work <input type="checkbox"/> Social <input type="checkbox"/> Shop <input type="checkbox"/> Recreation <input type="checkbox"/> School <input type="checkbox"/> Other <input type="checkbox"/> Medical	

10

11. How do you rate existing bus service?
Check one: ☐ Good ☐ Fair ☐ Poor
☐ No Opinion ☐ Not available
12. What agency should be responsible for the operations of transit service?
Check one: ☐ Private Bus Companies
☐ State
☐ Combination of State and Town
☐ Transit Authority
☐ No Opinion
13. Would you tolerate a small increase in local property tax to help support bus transit operations?
Check one: ☐ yes ☐ no ☐ don't know
14. How many members of your household have a handicap which restricts their travel as an:
a. Auto driver _____ (number of persons)
b. Bus/transit passenger _____ (number of persons)

11 12 13 14

Please Answer Questions on
Following Page Also. Thank you.

- 3 -

office use only

15. With regard to bus/transit service, how important do you rate each of the following factors? (Please mark one choice for each item.)

	Very Important	Fairly Important	Not Important	
a. New Buses	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	15 <input type="checkbox"/>
b. Benches at most bus stops	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
c. New Bus Stop signs	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
d. More frequent service				
Rush hour	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Mid-day	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Evening	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Weekend	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
e. Passenger shelters at major stops	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
f. Air-conditioned buses	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
g. A bus transit information service	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
h. Cleaner buses	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
i. Lower fares	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
j. Door to door service	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

16. Please indicate your family's annual income.
Check one: ☐ 0-4,999 ☐ 5,000-9,999 ☐ 10,000 or over

16 ☐

17. Please add any comments or suggestions you might have about the existing bus/transit service on the back of this form.

17 ☐

18. Should additional information be necessary for this study, may we call you? Please give your telephone number _____.

18 ☐

If you have any questions concerning this survey, please contact the Transit Study Representative at 583-1833.

Please return this questionnaire in the enclosed envelope to:
Old Colony Planning Council
232 Main Street
Brockton, Massachusetts 02401

THANK YOU FOR YOUR COOPERATION

APPENDIX G
BROCKTON AREA TRANSIT STUDY

1. Home Address _____
Street Number _____ Town _____ Zip _____
2. Age Group ___60-64 ___65-69 ___70-74 ___75 or over
3. Do you own a car or have a car available for your use? ___Yes ___No
4. Do you have a handicap which restricts your travel as an:
- a. Auto Driver Yes No b. Bus/transit passenger Yes No

5. SHOPPING TRIPS

6. MEDICAL TRIPS

7. SOCIAL RECREATION TRIPS

APPENDIX G (CONT.)

8. How do you rate existing bus service: Good Fair Poor

9. With regard to bus/transit service, how important do you rate each of the following factors: (Please mark one choice for each item.)

	Very Important	Fairly Important	Not Important
a. New Buses	_____	_____	_____
b. Benches at most bus stops	_____	_____	_____
c. New Bus Stop signs	_____	_____	_____
d. More frequent service	_____	_____	_____
Rush hour	_____	_____	_____
Mid-day	_____	_____	_____
Evening	_____	_____	_____
Weekend	_____	_____	_____
e. Passenger shelters at major stops	_____	_____	_____
f. Air-conditioned buses	_____	_____	_____
g. A bus transit information service	_____	_____	_____
h. Cleaner buses	_____	_____	_____
i. Lower fares	_____	_____	_____
j. Door to door service	_____	_____	_____

10. COMMENTS

Please drop your completed survey off at the OCPC booth or mail to:

Old Colony Planning Council
232 Main Street
Brockton, Mass. 02401

Encuesta de la poblacion de habla Espanola

- Indique abajo en donde Ud. hace sus compras generalmente/medicos/sociales/
viajes de recreo/concuanta frecuencia hace Ud. estos viajes y que medios
usa Ud. para hacerlos.

- | 6. <u>Viajes al medico</u> | Cuantas veces en la semana | Medios | | | |
|--|-----------------------------|-------------------|-------------------|-------------------|-------------------|
| | | Carro | Bus | Camina | Otros |
| Donde: | | | | | |
| <u> </u> Goddard Medical | <u> </u> | <u> </u> | <u> </u> | <u> </u> | <u> </u> |
| <u> </u> Brockton Hospital | <u> </u> | <u> </u> | <u> </u> | <u> </u> | <u> </u> |
| <u> </u> Cardinal Cushing | <u> </u> | <u> </u> | <u> </u> | <u> </u> | <u> </u> |
| <u> </u> Doctores en Down-
town Brockton | <u> </u> | <u> </u> | <u> </u> | <u> </u> | <u> </u> |
| <u> </u> Otros | <u> </u> | <u> </u> | <u> </u> | <u> </u> | <u> </u> |

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8. Donde trabaja _____
No. Calle _____ Ciudad _____
9. Como va a su trabajo? ____Carro ____Bus ____Camina
10. Como califica Ud. el servicio de buses que existe actualmente ____bueno ____pasable ____pobre
11. Hablando de servicio de transito, que importancia le daria Ud. a los siguientes factores: (Marque el que le parezca mas importante.)

	Muy Necesario	Necesario	No es necesario
a. Buses nuevos	_____	_____	_____
b. Asientos en la mayoría de las paradas	_____	_____	_____
c. Avisos nuevos en las paradas de buses	_____	_____	_____
d. Un servicio mas frecuente			
Hora del "rush"	_____	_____	_____
Medio dia	_____	_____	_____
Tarde	_____	_____	_____
Fin de semana	_____	_____	_____
e. Casetas para esperar el bus en las paradas mas importante	_____	_____	_____
f. Aire acondicionado en los buses	_____	_____	_____
g. Informacion acerca de las buses y sus rutas	_____	_____	_____
h. Buses mas limpios	_____	_____	_____
i. Pasajes mas baratos	_____	_____	_____
u. Servicio de puerta a puerta	_____	_____	_____

- ## 12. Comentarios

APPENDIX I

Brockton Area Transportation Study
Survey of Specialized Transportation

Name of Agency:

Name of individual to be contacted:

Address:

Telephone Number:

1. To what group of individuals does your agency provide transportation (i.e., elderly, welfare, etc.):

1a Average number of individuals served per month:
2. What type of vehicle does your agency presently use (i.e., Ford vans, private vehicles):
3. How many vehicles do you use:
4. What is your source of funds for providing transportation:
5. What is the approximate annual cost of providing service:
6. Do you feel that your agency meets the transportation of the people you serve:

Brockton Area Transit Study

Survey of Special Transportation Services

1. Name of Agency _____

Address _____

2. Name of individual whom our study staff may contact if there are any questions

Name

Telephone Number

3. Please list and describe below the special transportation services which your agency provides to individuals during the period of December 9, 1974 through December 22, 1974.

Date Service Provided	Where were the individuals taken? (Please give complete address)	How many individuals were transported?	What was trip purpose, i.e. medical, shop, etc.

APPENDIX I (CONT.)

-2-

Date Service provided	Where were the individuals taken? (Please give complete address)	How many individuals were transported?	What was trip purpose, i.e. medical, shop, etc.

4. Please describe the vehicles used in providing transportation services:

<u>Number of Vehicles</u>	<u>Year and Make</u>	<u>Number of Seats</u>	<u>Special Equipment</u>
Example: 1	1970 GMC Custom Wagon (Van)	12	Wheelchair ramp

5. From what source does the funding used to provide special transportation services come? Is this funding exclusively for transportation? Please describe.

Please return this form to: Mr. Wayne Hill
 Old Colony Planning Council
 232 Main Street
 Brockton, Mass. 02401

WHAT IS BROCKTON AREA TRANSIT?

Brockton Area Transit (BAT) is the name given to the public bus service to be operated within the city of Brockton and possibly throughout the near-by towns under the jurisdiction of the newly formed Brockton Transportation Authority.

Brookton Area Transit service will be operated by a private bus company under a contract with the Transportation Authority. With the use of available state and federal transportation funds, it will be possible to greatly improve and expand public transportation within the city of Brookton and throughout the region with little or no increase in local financial support.

Each of the eligible towns (Abington, Avon, Bridgewater, East Bridgewater, Easton, Hanson, Stoughton, West Bridgewater, and Whitman) can decide whether to join the Transportation Authority and how much local service should be provided. The cost to each town is determined by the level of service it chooses, thus insuring local control over the local costs.

The new Brockton Area Transit means a coordinated regional approach to public transportation in the Greater Brockton area.

WHAT IS THE JOINT TRANSPORTATION COMMITTEE?

The Joint Transportation Committee (JTC) is composed of representatives from the ten member municipalities in the region who work with the planning staff and delegates of the Old Colony Planning Council to further the goal of providing an efficient, balanced transportation system for the Old Colony area. With a commitment to attain the highest degree of participation, the group has an inclusive rather than exclusive membership policy which allows regional residents other than official representatives to become members and provide their input to the transportation planning process.

As actions in the past few years have shown, the major function of the JTC has been to act as a variable, accessible vehicle of citizen input and bring to laymen the means of understanding the complexities of planning for transportation improvements. The committee has been involved in short range long range transportation plans, the Regional Transportation Authority, a Transit Technical Study and numerous activities to insure that plans to move the people are made by the people.

WHAT IS THE OLD COLONY PLANNING COUNCIL?

The Old Colony Planning Council (OCPC) is the official regional planning agency for the Greater Brockton area and regional deerhunting for all federal program funds. The Council was established by state statute in 1967 and is authorized to prepare plans to improve the physical, social and economic conditions of the district. The Council has prepared plans, programs and policies for land use, water and sewer service, economic development, transportation, open-space, housing, and solid waste disposal. OCPC member communities include: Abington, Avon, Bridgewater, Brockton, East Abington, East Bridgewater, Easton, Henslow, Pembroke, West Abington, and Whitman. Each community is represented on the Council by a delegate and alternate member who set the policies and the priorities of the Council.

OCPC, the JTC and the Brockton Transportation Authority are co-sponsoring this contest as part of their efforts to promote the new Brockton Area Transit service. Brockton Area Transit can be the answer to many of the transportation problems in the Greater Brockton area. Brockton Area Transit needs your support.

You can win \$50 just by designing the winning logo (symbol!)

for the new Brockton Area Transit (BAT).

To be eligible, all you have to do is submit an entry by May 1, 1975.

Guidelines for the contest are as follows:

1. Entries in this contest will be judged in three categories:
 - a) Junior High School - grades 6 and 8;
 - b) High School - grades 9 through 12;
 - c) General public, including college.
 2. A winner will be picked in each of the three categories listed above and each of these winners will receive \$25.
 3. A Grand Prize Winner will be selected from the three category winners and will receive a Bonus Prize of \$25. This makes the total award to the Grand Prize Winner \$50!
 4. Ten additional prizes of a one month Brockton Area Transit bus pass will be awarded to entrants which receive honorable mention. All entrants will receive a free pass good for one ride on the Brockton Area Transit.
 5. Each entry must be submitted on white paper not to exceed 8 1/2" X 11 inches in size and may use two colors of ink.
 6. Each contestant may submit only one entry. Entries will not be returned.
 7. Each entry must be signed by the contestant on the back under the following statement: "This is my original work and in no way a copy of another's work. I submit it with the understanding that it will become the property of the Brockton Transportation Authority." Those under 18 should have their parent or guardian sign also. Entrants should also list their name, address, home phone number, age and grade in school on the back of the entry.
 8. Contestants should remember that a logo is a symbol which can be instantly recognized for what it represents. Examples of logos are the CBS "eye," the MBTA "T," and the Mass. Pike "hat and arrow."
 9. Entries will be judged on originality and applicability. The decision of the judges will be final.
 10. All prizes will be awarded — three Category Prizes of \$25 each and one Grand Prize Bonus of \$25 for a total of \$100 in cash plus ten one month Brockton Area Transit bus passes.
 11. All entries will become the property of the Brockton Transportation Authority and can be used without further compensation to the entrants.
 12. The Brockton Transportation Authority reserves the right to select the logo to represent its service and is not bound by the outcome of this contest.
- All entries must be postmarked no later than midnight, May 1, 1975 and should be sent to:



LOGO CONTEST

Joint Transportation Committee
Old Colony Planning Council
232 Main Street, Brockton, MA 01909



APPENDIX K

Brockton Area Transit Study

Staff Paper No. 4

Estimating Ridership for Alternatives

May, 1975

Old Colony Planning Council

City of Brockton

Urban Transportation Systems Associates, Inc.

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I. Introduction

The purpose of this document is to discuss the factors and methodologies which must be considered when estimating bus ridership. In producing a Transit Development Program, it is necessary to make estimates of future ridership to determine the benefits and the costs associated with the various alternatives.

There is no absolute method of predicting bus ridership on a new or improved system. There are ranges which have been developed and seem appropriate for various size communities. The level at which the public in one area react to service improvements can be substantially different from the reaction in another area. There are many reasons for differing reactions to improved bus service, however, these reactions are related to the socio-economic fabric of the area.

As discussed a number of times throughout the Brockton Area Transit Study, bus ridership on any route and in any system is related to a variety of conditions. Some of these conditions are more important than others in determining ridership. For example, if bus service is not dependable, that is, bus trips are skipped due to breakdowns, those people who use bus service by choice will use another mode of transportation. Even individuals who are considered captive riders will make every effort to find another mode of travel such as carpooling, or not making the trip at all, rather than be left standing on a corner. The frequency of the bus service, the interior and exterior appearance of the bus, the personality of the driver, the safety of travelers, and the fare structure are all important. Interestingly enough, the promotional program which is conducted is extremely important. That is, the program which effectively informs people that there is a bus service and explains the schedule, the stops, and how one can transfer between buses is extremely important in encouraging bus ridership.

It is virtually impossible to scientifically or mathematically build all these variables plus the variety of other factors into an equation or formula for accurately predicting ridership on various routes within a study area.

As difficult as it is to predict ridership, and as subjective a process as it is, one cannot develop and analyze alternative systems and recommendations without giving some consideration to anticipated ridership, as this will be the basis for revenue/operating cost comparisons of the various alternatives. Therefore, as part of the Brockton Area Transit Study, a variety of prediction methods were explored.

Over the past ten years there have been many efforts to establish methods of predicting bus ridership. Probably the most often utilized method has been the development of predicting equations or models based on a regression of existing statistics. That is, statistics concerning the magnitude of ridership in various areas or corridors have been compared to a variety of socio-economic statistics within that corridor. A number of variables have been utilized and the same variables have not always had the same level of importance. For example, in the Hartford Area Traffic Study, conducted in

che early 1960's, bus ridership was found to be more dependent on the population density of an area than on any other variable. In some studies, the comparison of transit travel times to auto travel times has been found to be the most significant variable. Often the most significant variable in studies is some relationship of population densities, car ownership, or income. One of the major problems in this statistical analysis is that ridership predictions are based on statistics developed considering the present service. The basic assumption in predicting ridership, then, is that many of the programs presently existing will continue to exist and whatever the public relations and promotional program is at the time of development of the statistics will be the same in the future. If marketing efforts are to be improved substantially, ridership will increase above the estimating equations but will not be predictable using the equations. This deficiency in prediction equations exists when considering a number of issues concerning improved bus transit. For example, the effects of the hiring and staffing of an administrative group to make service more efficient and effective; cleaner and more dependable buses; better scheduling and frequency, etc , are variables to which formulas cannot relate.

II. Factors Conducive to Increased Transit Patronage

For some time, the private automobile has provided the majority of the public with the most attractive means of satisfying transportation desires. Presently, however, due to a number of conditions including inflated automobile ownership and operational expenses, greater environmental concern, land use considerations, threatened and real fuel shortages, and increased funding opportunities, mass transit is beginning to experience a rebirth in many parts of the country. To be successful, this rebirth will require considerable effort by all agencies involved in providing transit services. A number of factors will go into the effort to improve the image and effectiveness of the transit system. This discussion presents some of the factors to be considered in the development of a bus transit system attractive to present non-riders.

Service Considerations

There are a variety of courses of action which can be taken when providing bus service. One course commonly used today is that of subsidizing a private operator and letting the operator be totally responsible for the service. In this alternative no effort is made to conduct promotional programs or to provide informational service. Consequently, service can get worse and ridership can drop.

Following is a discussion of conditions which, if properly addressed, will make service more effective and lead to increased ridership.

Frequency of Service: The most important service-related factor in attracting new transit riders is frequency of service. Every effort must be made to increase the frequency or level of service. This consideration, of course, must be consistent with financial constraints. The transit system is in competition with the automobile which requires little or no waiting time.

Walking Distances: The farther an individual has to walk to the transit stop, the less apt he is to use transit service. Generally speaking, distances exceeding one-quarter mile, or approximately a five-minute walk, result in few transit trips. In order for a transit system to be considered convenient, it must be located within a quarter-mile of the majority of residential units, and also within reasonable walking distance of desired destinations.

Reliability: A transit system which is not dependable will have a difficult time attracting or holding riders. A service with low dependability will not be successful in its efforts to increase patronage.

Effective Scheduling: It is important that considerable effort be made in developing schedules which relate to travel demands. Timing is crucial. Transit schedules must be coordinated to allow the optimum flexibility in the total transportation system. It would be valuable, for example, to schedule local buses to arrive at a terminal or transfer point just minutes before the departure of another local bus or possibly an intercity bus or rail service. Coordinated scheduling of this type would complement all components of the transportation system.

Promotional Systems: The need for effective marketing of transit service is often underestimated. Bus service is a product and should be treated as such. It is important for people to know where the product can be purchased and what they get for their money. To satisfy these justified consumer needs, colorful printed schedules should be readily available. These schedules should present everything a potential transit rider would need to know in an effective, easy-to-understand, systematic manner. There should be a well-publicized transit information telephone number which people could call around the clock to answer specific questions about schedules, routings, etc. To identify locations where buses stop, eye-catching signs and other identification should exist. Also, it would be beneficial to clearly display where people can go from each location and when the bus is scheduled to depart.

Fares: Finally, but certainly not last in importance, the transit service must be reasonable in cost. It may not be adequate to define reasonable as competitive to automobile expenses since it is questionable how long automobile expenses will be classified as reasonable (they may not be reasonable now!). All things considered, transit fares may have to be a bargain. However, all can benefit from this bargain.

Equipment Considerations

The previous discussion of service considerations leads to a detailing of needs which in turn will improve service. For example, the improvement of frequency of service and the improvement in reliability are related to additional buses.

Bus Vehicles: It is obvious that the bus itself is the single most important piece of equipment when looked at through the eyes of the consumer. It is essential that decrepit vehicles be replaced to maintain an attractive fleet. Certainly worn vehicles do not make for an attractive product. Often older vehicles do not offer the reliability which is inherent in new vehicles. The provision of new vehicles also provides the potential for addressing such needs as lower steps for the elderly and handicapped, increased padding for safety and comfort, improved insulation for lower noise levels and better temperature control. The new vehicles would be equipped with adequate pollution abatement equipment to minimize adverse environmental effects.

Bus Garages: To facilitate maintenance operations, it is necessary to have a modern and efficient bus garage. This garage would not only provide for necessary maintenance and repair capabilities, but would also protect the present fleet from the elements (to increase expected life), and provide additional storage area for future fleet expansion. Also, the new bus garage would afford the opportunity to have transit district offices in a location which would allow optimum supervisory control.

Terminals: To enhance transfer capabilities, considerations should be given to the establishment of a terminal in downtown Brockton. Basically, this facility would provide a point of focus for transportation activity in the region. Such facilities would ease various modal interchanges.

Passenger Shelters and Benches: To protect and increase comfort to individuals waiting to use the transit service, it is deemed important to have passenger

shelters and benches in many parts of the service area. Many varieties of shelters and benches are available today which can compliment almost any neighborhood or commercial setting.

Radio Communications: As a means of increasing system efficiency, the use of radio communications equipment is being tested in many areas. Consideration should be given to this possibility in designing an effective system to aid in insuring dependability of service. Mechanical breakdowns can immediately be identified and assistance rendered. Possibly more important, a replacement vehicle can continue the route so that the service interruption is minimized.

III. Variables Used in Predicting Ridership

The estimation of potential ridership is contingent upon the changes made to a system of routes and vehicles within a defined service area. Specifically, ridership is determined by user reaction to the following characteristics:

- Frequency of service
- Dependability of service
- Fare structure
- Magnitude and distribution of the population in the service area
- Accesibility of population outside the service area to the system
- Condition and comfort of rolling stock
- Availability of shelters at bus stops
- Ease of transfer and length of wait times
- Availability of clearly marked stops
- Availability of rate information and schedules
- The range of available destinations
- Relationship of auto versus bus travel times and costs

Different weights have been assigned to the above characteristics as a result of various studies conducted in conjunction with a number of mass transportation programs. The most significant impacts appear to be through changes in headways and fare structure. A recent report¹ indicates that a fare increase of one percent will decrease patronage approximately 0.3 percent. There is also some evidence that a decrease of one percent in the fare will increase patronage between 0.1 and 0.3 of one percent. There is a variance in these relationships depending upon the type of mass transit, the area served, the initial fare size, and the length of trip. The clearest definition available is that fare decreases will increase shopping trips more than work trips.

A second finding of the report is that increased frequency (headways) of service will increase patronage, but no clear pattern upon which to base an estimate of the increase was evident.

One study summarized in the same report found that a reduction in waiting time is more significant than a reduction in travel time. Where frequent headways exist, an increase in service will not alter patronage significantly. Increases in service have more effect upon riders in the middle and upper income groups because the lower income groups tends to be a captive audience.

Speed, comfort, convenience, and a diversity of destinations are also important factors in attempts to increase ridership. Several studies indicate that a decrease of 50 percent in elderly fares in the off-peak hours will increase patronage by about 25 percent.

A common method of estimating bus ridership utilized a relationship between the ratio of time required to travel between two points by auto and by bus. This

1 "A Review of Reports Relating to the Effect of Fare and Service Changes in Metropolitan Public Transportation Services", USDOT, Washington, June 1974.

approach requires the sophistication of simulated street and bus networks.

For the purposes of this study, socio-economic characteristics appear to be the major determinant for estimating bus ridership. These types of data were compiled through on-board, home interview, and attitudinal surveys conducted in the study area. Pertinent analyses are discussed in subsequent sections of this paper.

The regression analysis technique is expensive to implement because of the amount of detail required. It is difficult to include all necessary variables, and sometimes studies leave out of the analysis the variables which are probably most significant. Often it appears that the results of the regression analysis do not provide any better predictions than some of the simpler methods.

IV. Consideration of Fare Structure

Scheiner, in his paper concerning the patronage effects of free fare transit², developed some characteristics concerning the relationship of ridership to fare changes. Figure 1 shows the relationship of the patronage loss due to change in fares when the initial fare was free. Figure 2 shows the revenue yield with a change in fares from a 25¢ fare system. It should be noted in Figure 2 that as the fare increases, the number of passengers decreases; as the fare is reduced, the number of passengers increases.

As has been discussed, there is a direct relationship between fare structure and ridership. Certainly the greater the fare, the greater the negative impact that it has on ridership and certainly consideration must be given to the fact that there are two alternatives in recommending a plan. They are either to maximize ridership, or to maximize revenue. To some extent, the greater the amount of fare charged, the greater the revenue, until the point where the ridership decrease overcomes the revenue increase. Figure 3 is a summary of the relationship between fare increases and the impact that fare change has on ridership.

The analysis of fare structure is further impacted by the economic situation of the study area and the conditions existing at the time of the study. The present fare on the system is 25¢ for a Brockton trip, and 15¢ for the elderly. The fare was seen as reasonable and it was recommended that it be continued without any fare zones. At present there is a double fare for an individual travelling through the downtown area; one fare when boarding, and one when leaving. It was recommended that the double fare be eliminated and free transfers allowed.

Free Fare

Part of the analysis and development of alternative transit plans and the adoption of a specific plan must be the fare structure. It is the responsibility of the study staff to review various fare structures and make specific recommendations to the Steering Committee and Joint Transportation Committee. On the other hand, it is the responsibility of the towns to decide for themselves what the fare must be to meet the operating costs of the service provided. The decision must be made at the time when the towns are contracting for service.

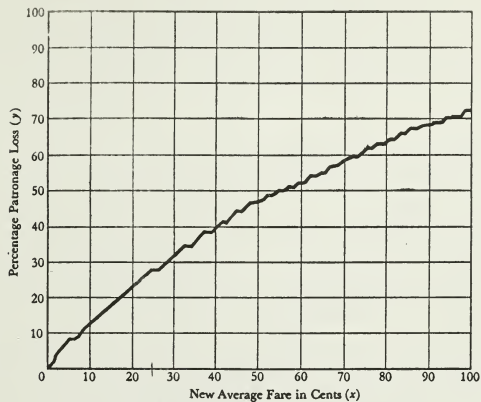
The staff has noted some interest on the part of committee members and representatives of special interest groups to provide a no-fare system for a variety of reasons, some of which are noted below:

- The elderly and low income cannot afford the 25¢ and 50¢ fares.
- A no-fare system would be much more appealing to the public, and considerably easier to promote.

2 Scheiner, James I., "The Patronage Effects of Free-Fare Transit", Traffic Quarterly

Figure 1

Patronage Loss as Transit Fares Increase from Free Fare Level



Note: $y = 1 - e^{-0.0124x}$

Figure 2

Relative Revenue Yield

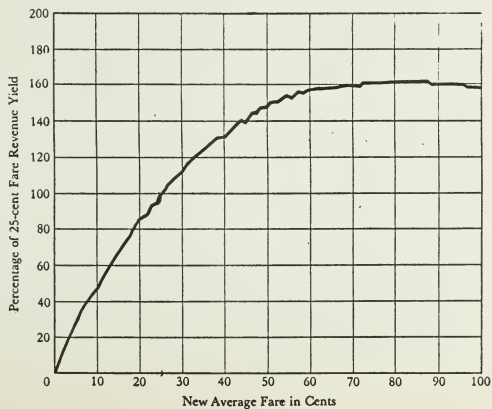
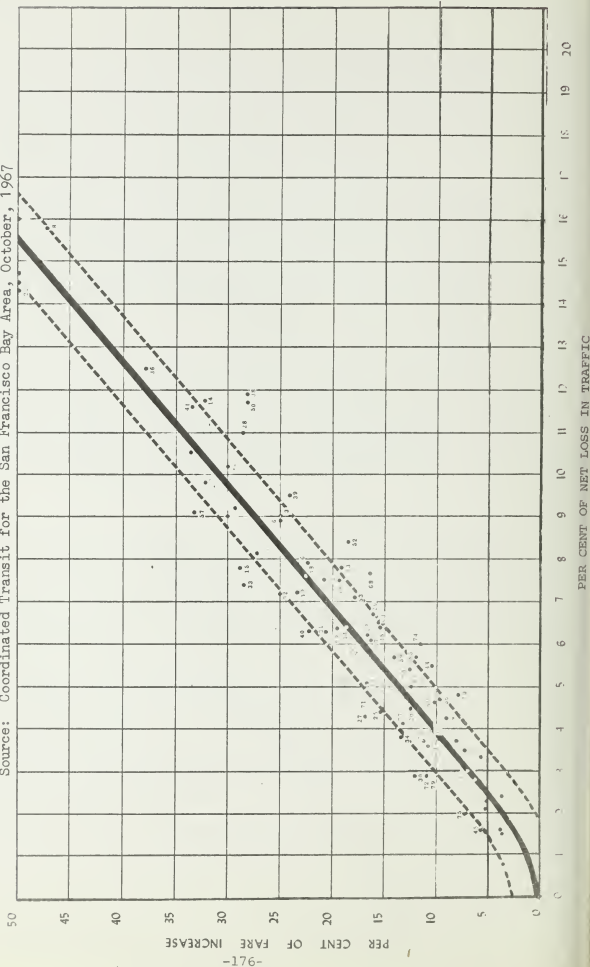


Figure 3

SHRINKAGE IN PASSENGER TRAFFIC DUE TO FARE INCREASE

TRANSIT PROPERTIES THROUGHOUT THE UNITED STATES

Source: Coordinated Transit for the San Francisco Bay Area, October, 1967



There are a number of advantages and disadvantages in providing no-fare bus service:

Advantages

- Reduction in out-of-pocket cost to the user.
- Makes promotional programs more appealing.
- Speeds up service because the operator does not have to handle money receiving fares, making change, emptying fare boxes, counting money, making deposits, etc.

Disadvantages

- There has been a problem in no-fare service with individuals who continually ride the free service as a pastime.
- The cost to the authority of operating the service increases by the amount of revenue not collected.
- A contract with a private operator would not include an incentive program based on revenue collected, which is the most straight-forward type of incentive program.
- From studies conducted by USDOT, a no-fare system increases ridership as much as 25 percent only for the first few months. Then, with no other changes, ridership drops to the level before no-fare.

Other Considerations

There is an interest on the part of USDOT, the city of Brockton, and BAT to provide public service to the elderly and students at a reduced rate. An elderly patron with proper identification currently pays a 15¢ bus fare. The 1974 amendments to the 1964 Mass Transportation Act state that an operating agency cannot charge more than half regular fare to the elderly in the off-peak periods. It is recognized by all involved in planning bus service, that there is a need to provide the service as economically as possible, especially to those individuals living on a restricted income. The question that must be addressed is what is a feasible fare structure for the public in general and for those with financial difficulties. The latent demand survey conducted throughout the study area showed that 45 percent of all those interviewed felt that fare was an important consideration in using the service, 42 percent felt that it was of medium importance, and 13 percent said that it was unimportant.

Consideration has been given to quantifying the amount of operating costs that could possibly be saved by not collecting fares. This assumes that there are certain costs related to fare collection. The present fare structure and future fare structures should be exact change, requiring no additional time spent by the driver making change and therefore not slowing down the bus service. Emptying the fare boxes when the buses return in the evening takes approximately one hour and that cost is approximately \$50 per week. Further, there is time required in bundling and counting the money. The Transit Development Program being recommended includes the cost of purchasing a coin counter and wrapper which will substantially reduce that effort. Therefore, it is assumed that with the coin counter, the costs for bundling and counting will be approximately \$100 per week and an additional \$100 per

week is set aside for the required bookkeeping. Therefore, the following breakdown of costs has been developed:

Average Weekly Revenue, December, 1974 and January, 1975: \$2,447.33

Cost for Collecting Fares

1. Emptying boxes	\$ 50.00
2. Counting coins	100.00
3. Associated bookkeeping	<u>100.00</u>
Total	\$250.00

V. Area Statistics

Population in the Service Area

Determination of the distribution of population within the service area was determined by plotting a one-half mile band over the bus route (one-quarter mile on each side of the route) and using the Census block data, to estimate the number of residents within the assumed one-quarter mile (or five-minute) walking distance.

Figure 4 illustrates the routes required to serve 90 percent of the population of the city of Brockton.

One of the factors that must be considered in the analysis of system ridership is the magnitude of the population served by the present bus system and by the recommended bus system. An analysis of a variety of socio-economic statistics was made and specifically, population densities were developed for the recommended densities of the primary routes in the recommended system.

Table 1

Population Served by Recommended Transit Improvement Program

<u>Primary Routes</u>	<u>Pop. Served</u>	<u>Sq. Miles</u>	<u>Pop./Sq. Mile</u>
Belmont	3830	1.7	2253
Westgate	4520	0.75	6027
Montello	7303	0.99	7377
Centre-Crescent	8678	1.52	5709
Campello	6860	1.17	5863
	<u>31,191</u>		
Downtown	<u>5,974</u>	0.52	11,488
	37,165		

Secondary Routes

Serve 43,000 within one-quarter mile

The income level of the population within the service area also influences ridership. An analysis of bus trips as reported in Journey-to-Work Census Data and the work trips reported in the attitude survey versus income level resulted in the rates shown in the following table.

Table 2

Bus Riders by Income Level (Work Trips To Work Only)

<u>Income Level</u>	<u>Trips/1000 Population</u>	
	<u>Census J-to-W</u>	<u>Attitude Survey</u>
Under \$8,300 (Low)	7.26	6.45
\$8,301 - \$10,500 (Middle)	7.94	4.28
\$10,501 - Over (High)	7.58	4.58

FIGURE 4
FIVE YEAR SEQUENTIAL PLAN



Because of the larger areal units defined by the Journey-to-Work data, the rates shown do not adequately represent actual usage. The attitude survey rates appear reasonable and follow the general pattern of significantly high usage by the low income category and the slightly higher rate for high income as compared to the middle income range.

Trip Purposes

One indication of whether a bus system is adequately meeting the needs of the area is an analysis of the trip purposes of the existing riders. Table 3 shows the trip purposes for the Brockton study area.

Table 3

<u>Work</u>	<u>Transit Trips by Purpose</u>	<u>School</u>	<u>Other</u>
42%	<u>Shopping</u>	8%	21%
	29%		

Only three percent of the residents of the city of Brockton use bus service, while 28 percent of the residents of the city of Hartford, Connecticut use bus service for work.³

Approximately 23 percent of all trips made in the Brockton area were work trips, however as Table 3 indicates, 42 percent of all bus trips made were for work purposes, indicating that there is a deficiency in meeting the needs of non-work trips. A similar analysis can be made for the number of individuals riding the service who are considered captive riders. From the on-board survey it was determined that the captive ridership was 84 percent at a minimum. As the system becomes more efficient, the percentage of captive riders should reduce.

Headways

Changes in the headways have been identified as having a measurable impact on ridership. A comparison of routes in Brockton between 1970 and 1974 (periods of time at which different headways existed and for which travel data are available) indicated that a reduction in headways (15-minute frequency to 30-minute frequency) actually resulted in a net increase in ridership on one route in the existing Brockton system.

3 Source: A New Mobility for the Capital Region 2/72

VI. New Attitude Toward Bus Transit Service

In the past few years, agencies responsible for providing local bus service have begun to change their attitudes toward providing local service. This has been brought about partially by the energy shortage of early 1973 and by experiments which have been conducted recently. Basically, the change in attitude has been two-fold. First, local officials, for the most part, have recognized that local bus service must be subsidized, and that it is required to accommodate those in our society without an automobile. Second, it is recognized that local service must be operated as a utility which cannot be cut back until there is no cost left for the public to pay. Local bus service must be marketed and promoted in an effort to develop good public relations and understanding. Urban areas taking this approach toward providing local bus service are realizing increases in ridership. Surely the 1974 Mass Transit Act, providing subsidies for operating service, will aid in increasing the level of ridership throughout the country still more.

VII. The General Approach to Plan Development

Realizing that the ultimate objective of this study is to recommend an approved transit system for the Brockton area, a number of issues were addressed to aid in the development of the system, and more specifically, to aid in determining the potential ridership or the market for the future system.

One of the initial efforts was to conduct an attitude survey in the area not only to determine the present attitudes toward transportation and those issues which the public would like to see addressed, but also to determine the potential demand for service. The data resulting from this type of survey is inflated; however, the data does present some indication of those areas needing some sort of transit service. Figures 5 and 6 show the number of persons who would like to make a transit trip, plotted by their places of residence. Figures 7 and 8 show the number who would make transit trips by their places of destination. These do not reflect two-way trips, but rather only the trip from a place of residence to the destination. That is, the trip does not include the return home.

The second effort was an attempt to determine what the captive ridership of the system would be. A variety of statistics were developed from the on-board survey for the number of persons who have no other transportation. It was determined that a minimum of 84 percent of those individuals utilizing the bus service were captive riders. In addition, an effort was made to determine the captive ridership in areas beyond the three-block distance from bus routes.

Another approach in looking at future ridership was to improve bus service and encourage ridership to the level at which the system was utilized in the 1950's. This is not an entirely practical approach to considering ridership unless one feels strongly that the energy crisis will continue to worsen in the future, and that significant imaginative steps will be taken by BAT and the operators to provide a more efficient type of service. Also, social and economic conditions have greatly changed in the last two decades so that a return to the level of ownership and income of the 1950's is improbable.

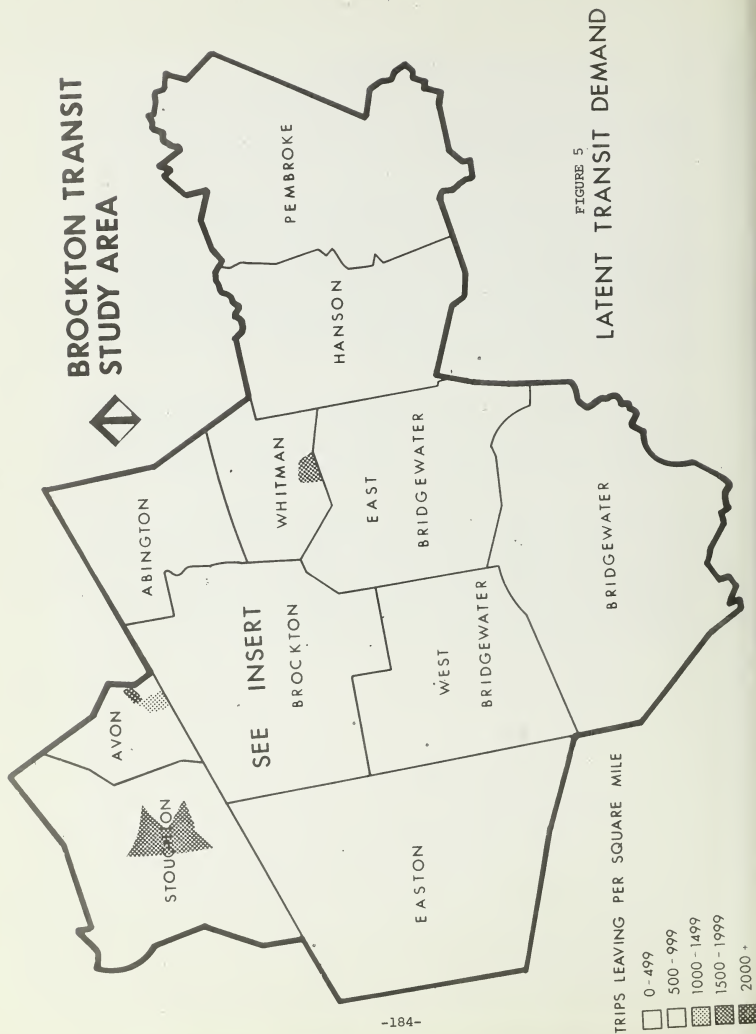
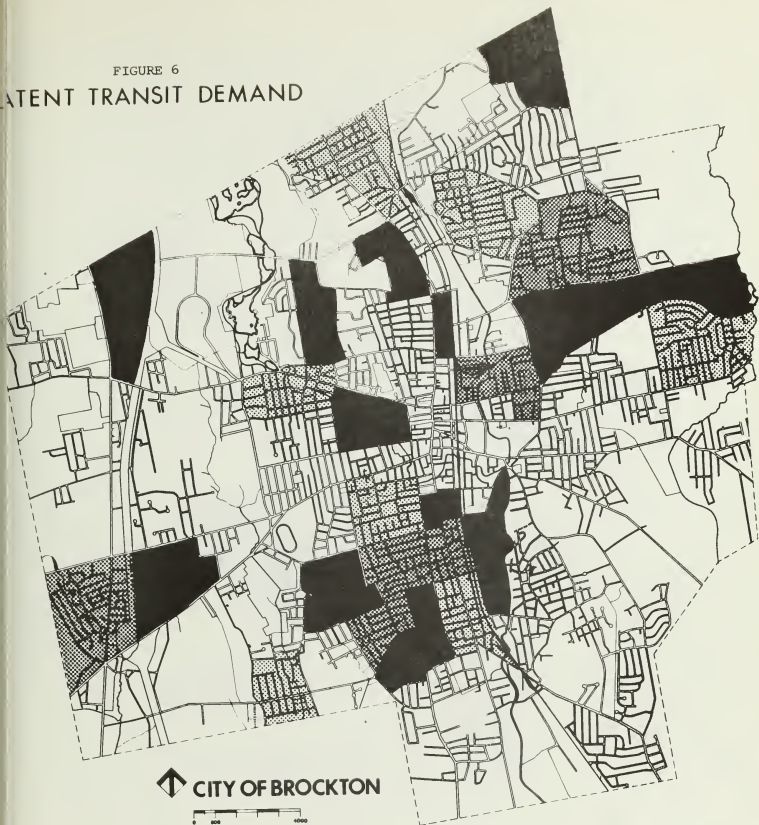


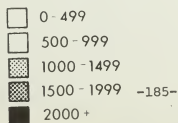
FIGURE 5
LATENT TRANSIT DEMAND

FIGURE 6

LATENT TRANSIT DEMAND



TRIPS LEAVING PER SQUARE MILE



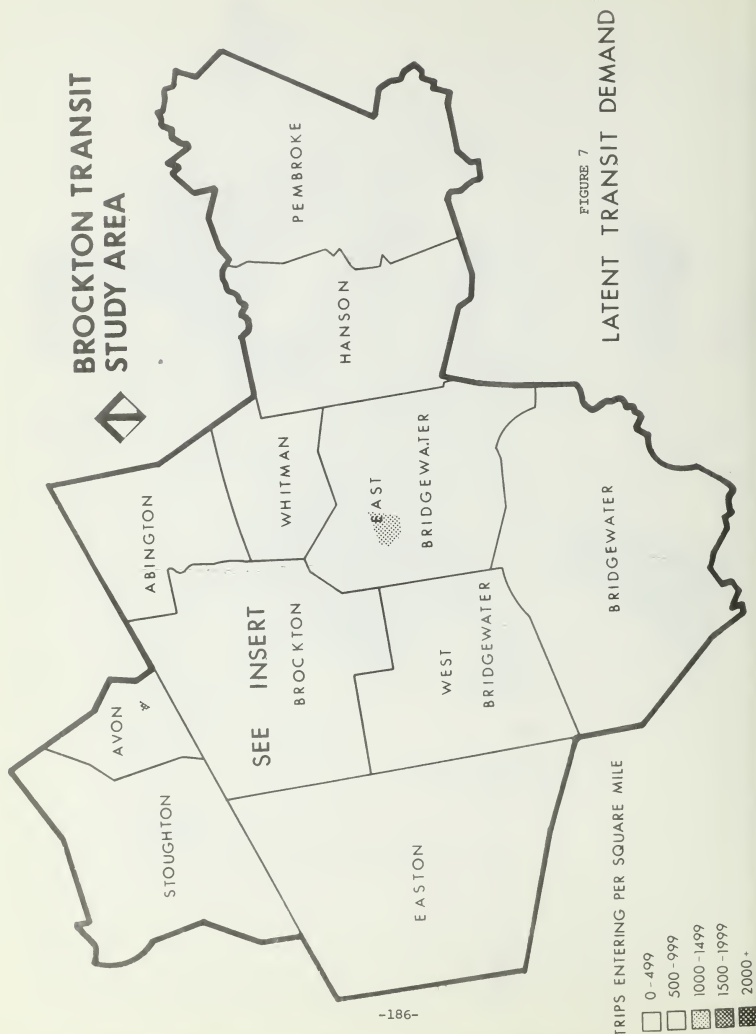
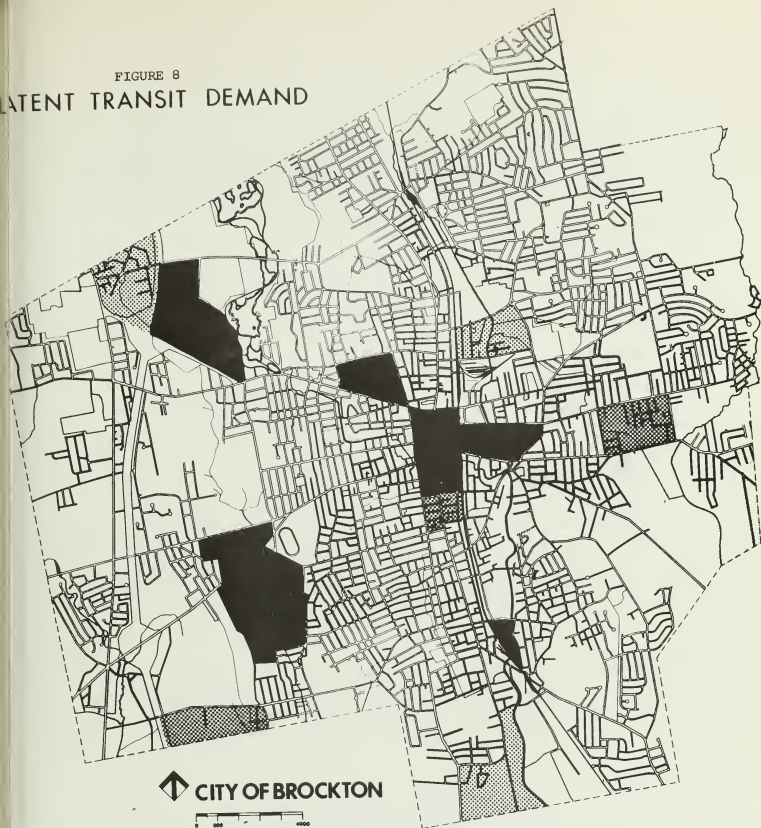


FIGURE 7

LATENT TRANSIT DEMAND

FIGURE 8
LATENT TRANSIT DEMAND



TRIPS ENTERING PER SQUARE MILE



VIII. "Effectiveness" Method of Estimating

This section discusses the "effectiveness" approach to predicting ridership on an improved local bus system. This method takes into account an increased level of ridership based on the attitude that local service does not have to pay its own way, that it should be operated dependably, and that service should be provided to those without automobiles.

When developing specific bus route improvements and frequencies, there is obviously a need to look at specific socio-economic statistics such as population densities, minority locations, elderly concentrations, major employers, etc. In addition, existing bus routes must be surveyed to determine the productivity rate for each route where service is presently provided. These productivities should be correlated with the frequency and dependability which exists.

This system effectiveness method must be related to the area population and density, and a reasonable daily or annual revenue bus miles of service in the area. The ridership assumptions are directly based on a given amount of revenue bus miles and it is illogical to continue to increase revenue bus miles beyond the same general magnitude so that ridership increases. As ridership increases and bus miles increase, the operating deficit also increases. Revenue miles of service is the key ingredient to estimating ridership and it is important to be conservative in predicting the need for bus service. The approach includes an analysis of those areas which should have bus service due to their high densities and socio-economic conditions, and an estimate of the frequency of service needed. Knowing the bus route miles and the frequencies, the daily revenue miles of service can be calculated. In developing revenue miles of service there is an optimum point at which the addition of service will bring about a declining increase in ridership.

Productivity in Other Systems

As mentioned earlier, it is important when utilizing productivity as a method of predicting ridership, to consider the productivity of other systems throughout the country. Table 4 displays the productivity of a variety of the aforementioned transit operations.

Productivity of Brockton Routes

The productivity of each existing route was developed at the outset of the study and in conjunction with the socio-economic analysis which was conducted, was projected for the improved service for the five-year period. Table 5 is a summary of the productivity by route used for the analysis of the recommended system. The productivity was estimated for the fifth year of the program, and based on data available from other studies, the productivity rate was adjusted downward for the first four years of operations. That is, the estimates reflect a continuing increase in ridership over the five-year period as the service is implemented and improved.

Table 4

Brockton Area Transit in National Perspective

Name of Urban Area	Population	1974 Regular Bus Route			
		Revenue Miles		Passenger Trips	
		Total	Per Capita	Total	Per Capita
Lansing, Michigan	229,518	1,100,000	4.79	2,300,000	10.02
Charleston, So. Carolina	228,399	1,700,000	7.44	4,900,000	21.45
Fort Wayne, Indiana	225,184	1,900,000	8.44	3,300,000	14.65
Chattanooga, Tennessee	223,580	2,100,000	9.39	3,400,000	15.21
Little Rock, Arkansas	222,616	2,000,000	8.98	3,800,000	17.07
Corpus Christi, Texas	212,820	1,500,000	7.05	2,600,000	12.22
Columbus, Georgia	208,616	1,800,000	8.63	4,100,000	19.65
Rockford, Illinois	206,084	900,000	4.37	2,500,000	12.13
Allentown-Bethlehem-Easton, Pennsylvania	363,517	1,800,000	4.95	4,100,000	11.28
Harrisburg, Pennsylvania	240,751	1,900,000	7.89	4,700,000	19.52
Scranton, Pennsylvania	204,205	1,100,000	5.39	2,700,000	13.22
Erie, Pennsylvania	175,263	1,700,000	9.70	5,300,000	30.24
Reading, Pennsylvania	167,932	1,700,000	6.55	3,400,000	20.25
Lancaster, Pennsylvania	117,097	1,100,000	9.39	1,800,000	15.37
Wilkes-Barre, Pa.	222,830	1,900,000	8.53	5,500,000	24.67
Coral Gables, Florida		1,250,000		3,500,000	2.80
Mankato, Indiana	38,000	117,800		232,000	2.00
Fall River, Mass.		664,000		1,692,000	2.55
Brockton, Mass. 1974	89,000	438,000	4.92	594,000	6.67
Brockton, Mass. Area, 1980	160,000	1,304,000	8.15	1,980,000	12.37
					1.52

Source: Simson & Curtin estimates for calendar 1974 based on interviews with transit agencies in April-May, 1974.

Table 5
Productivity Rates by Route

Route	Present Range ¹	Y E A R				
		1	2	3	4	5
Campello	2.6-3.1	2.3	2.3	2.4	2.5	2.5
Montello	2.6-3.1	2.3	2.3	2.4	2.5	2.5
Belmont	2.0-2.5	1.8	1.8	1.9	2.0	2.0
Pleasant	2.0-2.5	1.7	1.8	1.9	2.0	2.0
Centre	1.5	1.5	1.5	1.6	1.6	1.7
Crescent	1.5	1.4	1.4	1.5	1.5	1.5
Copeland	1.6	1.3	1.3	1.4	1.5	1.5
Ashland	1.6	1.3	1.3	1.3	1.5	1.5
Perkins	0.5-0.8	1.2	1.2	1.3	1.4	1.3
Ames	0.5-0.8	1.2	1.2	1.3	1.3	1.3
Ash		1.2	1.2	1.2	1.3	1.3
Torrey		1.0	1.1	1.3	1.4	1.5
Oak/Belair			1.1	1.2	1.2	1.3
Stoughton			1.0	1.0	1.0	1.0
Easton North			1.0	1.0	1.0	1.0
Easton South			0.9	0.9	1.0	1.0
Avon			1.6	1.6	1.7	1.8
Whitman				0.7	0.7	0.8
West Bridgewater				0.7	0.7	0.8
Bridgewater				<u>0.7</u>	<u>0.7</u>	<u>0.8</u>
		1.54	1.47	1.46	1.48	1.52

¹ Ranges due to surveys being conducted at different times

APPENDIX L

Brockton Area Transit Study

Staff Paper No. 5

Analysis of Alternative Plans

(Excerpts)

March, 1975

Old Colony Planning Council

City of Brockton

Urban Transportation Systems Associates, Inc.

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II Discussion of Calculations for the Sequential Plan	194

APPENDIX L
Comparison of Alternatives
From Staff Paper #5 - Analysis of Alternative Plans

Alternative	1A	1B	1C	3A	3C	3D	3E
Year	5	5	5	5	5	5	5
Weekday Route Miles	57.3	121.9	123.4	99.9	(5)	(5)	(5)
Daily Revenue Miles	1761.0	4,231.0	4,272.0	4,696	(5)	(5)	(5)
Annual Revenue Miles	486,036	1,167,756	1,179,072	1,296,000	(5)	(5)	(5)
Number of Buses in Operation ¹	9	29	29	34	34	36	36
Small	0	20	20	11	11	11	11
Large	9	9	9	23	23	25	25
Annual Hours of Operation	32,500	108,744	108,744	131,400	131,400	131,400	121,716
Assumed Ridership							
Average Weekday	3,695	6,419	6,300	6,250	6,614	6,317	6,450
Annual	1,022,550	1,766,000	1,738,800	1,625,000	1,825,000	1,698,000	1,780,200
Weekday							
Productivity Factor	2.1	1.5	1.5	1.5	(5)	(5)	(5)
Annual Operating Cost	\$325,000	\$1,087,440	\$1,087,440	\$1,314,000	\$1,314,000	\$1,314,000	\$1,219,160
Administrative Cost	\$50,000	\$50,000	\$50,000	\$50,000	\$50,000	\$50,000	\$50,000
Bonding ²	\$82,500	\$82,500	\$82,500	\$82,500	\$82,500	\$82,500	\$82,500
Total Annual Costs	\$457,500	\$1,219,940	\$1,219,940	\$1,446,500	\$1,446,500	\$1,446,500	\$1,349,660
Annual Revenue	\$204,510	\$353,200	\$347,600	\$324,000	\$365,000	\$339,000	\$356,000
Deficit (Total)	\$252,990	\$866,740	\$872,340	\$1,122,500	\$1,081,500	\$1,107,500	\$993,660
Federal Share ³	\$85,245	\$392,120	\$394,920	\$520,000	\$499,500	\$512,500	\$455,580
Suburban Deficit	N.A.	\$133,014	\$119,051	\$130,137	\$128,287	\$129,011	\$129,778
Suburban Share ⁴	N.A.	\$66,507	\$59,525	\$65,068	\$64,143	\$64,889	\$64,889
Brockton Deficit	\$167,745	\$341,606	\$358,369	\$472,363	\$453,713	\$465,989	\$408,302
Brockton Share ⁴	\$83,872	\$170,803	\$179,185	\$236,181	\$226,857	\$232,995	\$204,151

*NA = Not Applicable

This table is a summary of data used in analyzing the alternative plans developed as part of the study. An expanded version of Alternative 1B was adopted, further modified and detailed. The final figures for this recommended alternative are presented in Table 5-3.

1. Excludes spares
2. Does not qualify for federal funds
3. 50 percent of deficit excluding bonding
4. 50 percent Federal, 25 percent State, 25 percent Local
5. Not appropriate to calculate with Demand-Responsive

Discussion of Calculations for the Sequential Plan

Table 5-3 "Sequential Plan Operating Statistics - Years 1 through 5" found on page 123 of the TDP presents a variety of operating statistics for the recommended sequential plan for the Brockton area. The purpose of this brief discussion is to point out and document a number of the conditions that were applied in the development of this table. Following are some of the more major conditions prior to a detailed discussion on the table.

1. The table includes bus service recommendations for the Brockton area. The first year includes only the city of Brockton and then, as recommended in the TDP, the plan is expanded to six additional towns over a period of the next four years.
2. This table does not include statistics related to the demand responsive service which has been recommended in the TDP. Demand responsive statistics are provided in table 5-4 on page 124.
3. The assumption made in the development of some of the statistics in this table including the assumed ridership and hours of operation are based on the implementation of the entire TDP including marketing, promotional and management areas and the general overall enthusiasm for the improvement of bus service within the Brockton area. Many of the statistics are related to existing conditions within the Brockton area, such as existing wage rates and bus travel speeds. As these types of conditions change in the future this table should be revised. The dollar values in the table are constant 1974 dollars.

The following discussion is itemized according to the title on the left hand edge of the table.

Year: This item is related to a full year of service and not specifically related to a calendar year or fiscal year. It applies to the first year of implementation of the program.

Weekday Route Miles: This includes the miles of bus routes that are served by city transit buses. It is not related to the direction in which the bus travels. That is, a mile of Main Street with service in both directions is counted as one bus route mile. If there are three bus routes on that one mile of Main Street it is counted as three bus route miles. Data was developed by measuring each recommended route.

Daily Revenue Miles: This refers to the total miles that the buses drive on the average weekday to carry passengers.

Annual Revenue Miles: This is an estimate of the revenue bus miles of travel for the entire year. A standard factor was used for calculating annual statistics. It was assumed that Saturday service would be approximately one-half of weekday service. Using this assumption, the daily revenue miles of travel was multiplied by a factor of 276 to obtain annual revenue miles of travel. The factor was developed by assuming 250 days of weekday service and adding 0.5 times 52 weeks for Saturday service. This assumes that bus service will not be operated on holidays. This number was calculated using length of bus route and bus frequency.

Number of Buses in Operation: This is the number of buses required based on the recommended routings, frequency and operating speeds to provide the recommended service. Large buses were recommended on those routes with very heavy ridership in the peak periods plus street conditions that would facilitate large buses; small buses were recommended for the remainder of the system.

Annual Hours of Operation: This is based on the amount of time in the average weekday necessary to provide the recommended level of service and includes deadhead time. The required daily hours of operation was then multiplied by 276 to determine annual hours of operation.

Assumed Ridership: The ridership statistics were developed using ridership per revenue mile (productivity method) and a variety of socio-economic statistics for the area. That data has been discussed in Staff Paper #4 - "Estimate of Future Ridership." Annual assumed ridership is weekday ridership factored by 276.

Weekday Productivity Factor: These factors were developed from current and projected ridership figures and applied to revenue mile statistics to obtain assumed ridership projections.

Annual Operating Costs: Annual operating costs are the costs of providing local service but exclude administrative costs and the costs of bonding capital improvements. Annual operating costs were determined using existing costs and were assumed to be approximately \$10.00 per hour for the initiation of improved service and expanded to \$10.64 per hour by the fourth and fifth year. No consideration or assumptions were made concerning increased labor costs in the future based on the establishment of Brockton Area Transit and expansion of service.

Administrative Costs: These are the costs of providing an administrative staff for Brockton Area Transit to assist in the management and operations of the service.

Bonding Costs: Bonding costs are assumed to be \$82,500 a year over the five year period for the bonding of the local share of the capital improvements. These are the local share figures after subtracting the 80 percent that will be funded by UMTA.

Total Annual Costs: Total annual costs are the sum of annual operating, administrative and bonding costs for each year covered.

Annual Revenue: This is based on an average fare of 20 cents per passenger in the system.

Deficit (Total): This is calculated by subtracting annual revenue from total annual costs.

Federal Share: This is assumed to be 50 percent of the deficit after the local share of bonding costs was subtracted. In that it is assumed that UMTA will pay 80 percent of the capital cost, UMTA money will not qualify for the bonding of the local share (the remaining 20 percent). Therefore the \$82,500 in annual bonding costs has been assumed to be shared by the state and local agencies.

Suburban Deficit and Brockton Deficit: These deficits were calculated on an apportionment of total local deficit based on share of operating cost and revenue plus bonding costs.

Suburban Share and Brockton Share: These are based on the assumption that the state pays 50 percent of the suburban and Brockton deficits.

Table 5-3 does contain a substantial amount of data including some specific assumptions concerning operating costs and ridership, etc. The advantage in this table and the procedures used is that further analysis and surveillance of the existing operation will provide more up-to-date data for re-calculating and re-generating these types of statistics for future review by the Brockton Area Transit and other agencies participating in providing service.

APPENDIX M

.Brockton Area Transit Study

Staff Paper No. 6

Survey of Rail Passenger Service

June, 1975

Old Colony Planning Council

City of Brockton

Urban Transportation Systems Associates Inc.

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III	The Survey.	199

I. Introduction

As part of the Brockton Area Transit Study, a survey was made of area residents using the rail service from Stoughton to Back Bay Station and South Station. The purpose of the survey was to generally determine the characteristics of the users and relate that service to the expansion of bus service in the area. In addition, OCPC and some residents of the area are analyzing the need for extending the rail service from Stoughton to Easton. Although that was not the purpose of this survey some of the data that was collected as part of the survey can be used in that later analysis.

II. Available Train Service

Regional rail passenger service is limited to commuter runs from Stoughton to Back Bay and South Station. Service is provided twice in the morning and twice in the evening five days a week with one round trip on Saturdays. Ridership averages 470 on weekdays. Table 1 provides a breakdown of passenger service. Service is also available from Boston at 6:39 A.M. and 7:33 A.M. and to Boston at 5:59 P.M. and 6:34 P.M. An extension of rail passenger service to Easton has been proposed and is a JTC "short range" priority item.

TABLE 1
PASSENGER SERVICE THROUGH STOUGHTON STATION

<u>Train</u>	<u>Days</u>	<u>Avg. M-F</u>	<u>Pas. Sat</u>	<u>Leave Stoughton</u>	<u>Arrive/Leave Back Bay</u>	<u>Arrive/Leave South Station</u>	<u>Arrive Stoughton</u>
800	M-F	200	-	7:40 A.M.	8:11 A.M.	8:16 A.M.	-
802	M-S	37	20	8:12 A.M.	8:42 A.M.	8:47 A.M.	-
811	M-F	198	-	-	5:19 P.M.	5:14 P.M.	5:48 P.M.
815	M-F	35	-	-	5:55 P.M.	5:50 P.M.	6:24 P.M.
813	S	-	15	-	5:50 P.M.	5:45 P.M.	6:15 P.M.

Source: Penn Central Office, New Haven, Conn. & OCPC Ridership Survey

III. The Survey

The survey of passengers was conducted on November 14, 1974 by Study Staff. The staff actually rode the trains in the morning to Boston and passed out the interview form (see Figure) and collected the form while on-board the train. In addition, the staff rode the train on the return trips in the evening and asked the riders again to complete the survey form. The survey was conducted only for those individuals that boarded or disembarked from the trains in Stoughton, the terminus of the service.

Figure 1

This information will be held in strictest confidence

BROCKTON AREA TRANSIT STUDY

Dear Train Rider:

This survey of train riding is being conducted in order to plan for better service in the Brockton area. Your assistance will provide essential information for this planning. Please complete the questionnaire before leaving the train and return it to the study representative or drop in a mail box. Your cooperation in this important survey is appreciated.

This study is being conducted by the Old Colony Planning Council and the City of Brockton in cooperation with the U.S. Department of Transportation.

1. WHERE DID YOU START THIS TRIP? _____
(to reach station) give nearest street intersection town
2. WHERE ARE YOU GOING? _____
(after leaving train) give nearest street intersection town
3. HOW DID YOU GET TO THE TRAIN STATION? (PLEASE CHECK ONE)

1 <input type="checkbox"/> Walked less than 1 block	4 <input type="checkbox"/> Driven to the station
2 <input type="checkbox"/> Walked 1-3 blocks	5 <input type="checkbox"/> Drove to the station and parked
3 <input type="checkbox"/> Walked 4 blocks or more	6 <input type="checkbox"/> Other
4. WHAT IS MAIN PURPOSE OF YOUR TRIP? (PLEASE CHECK ONE)

1 <input type="checkbox"/> Work	3 <input type="checkbox"/> School	5 <input type="checkbox"/> Social Activity	<input type="checkbox"/> Other
2 <input type="checkbox"/> Shopping	4 <input type="checkbox"/> Medical	6 <input type="checkbox"/> Recreational Activity	
5. AFTER LEAVING TRAIN, HOW WILL YOU GET TO YOUR FINAL DESTINATION? (CHECK ONE)

1 <input type="checkbox"/> Walk less than 1 block	4 <input type="checkbox"/> Automobile
2 <input type="checkbox"/> Walk 1-3 blocks	5 <input type="checkbox"/> Taxi
3 <input type="checkbox"/> Walk 4 blocks or more	6 <input type="checkbox"/> Bus
6. DO YOU HAVE A DRIVER'S LICENSE? 1 ☐ Yes 2 ☐ No
7. HOW MANY AUTOMOBILES ARE AVAILABLE IN FAMILY? ☐
8. IF YOU HAVE A LICENSE, WAS AN AUTOMOBILE AVAILABLE FOR YOUR USE? 1 ☐ Yes 2 ☐ No
9. HOW OFTEN DO YOU TAKE THE TRAIN? (PLEASE CHECK ONE)

1 <input type="checkbox"/> Daily	2 <input type="checkbox"/> 1-2 times a week	3 <input type="checkbox"/> Other
----------------------------------	---	----------------------------------
10. AGE: 1 ☐ Under 14 3 ☐ 20 - 24 5 ☐ 35 - 64
2 ☐ 15 - 19 4 ☐ 25 - 34 6 ☐ 65 or over
11. SEX: 1 ☐ Male 2 ☐ Female

AFTER COMPLETION OF THIS CARD, GIVE IT TO THE DRIVER OR DROP IN ANY U.S. MAIL BOX
THANK YOU.

Ridership Statistics

On the day of the survey there were a total of 237 riders outbound in the AM to South Station. 185 riders completed survey forms.

As shown on the survey form the interviewee was asked to record the location where he began his trip. It is suspected that this question was often answered incorrectly, that is individuals on the outbound trips in the morning were recording that they began their trip in Stoughton (at the railroad station) when they were more than likely beginning their trip either in Stoughton or in a surrounding community. Therefore, the survey did not produce accurate results concerning the place of residents of the passenger. In the future, if this particular data is required it is suggested that the question be asked by an interviewer rather than having the interviewee fill out the form himself.

Additional Statistics

Table 2 is a variety of other statistics that were collected as part of the study.

The data that was collected has been keypunched and some of the data, at least that found in this report, tabulated. Other tabulations can be made with the punch cards if desired.

Table 2

SUMMARY OF ONBOARD RAIL PASSENGER SURVEY

Data For Survey Outbound (From Stoughton to Boston)	# of Replies	Percent
How did you get to the train station?		
Walk one block	2	1.1
Walk two blocks	9	4.9
Walked over two blocks	12	6.5
Drove to stop	58	31.3
Drove and parked	104	56.2
Other		
No Answer		
	<u>185</u>	<u>100.0%</u>
What is main purpose of your trip?		
Work	184	99.5
Shopping		
School	1	.5
Medical		
Social		
Recreational		
No Answer		
	<u>185</u>	<u>100.0%</u>
After leaving train, how will you get to final destination?		
Walk one block	7	3.8
Walk two blocks	81	43.8
Walk over two blocks	73	39.4
Auto	3	1.6
Taxi		
Bus	17	9.2
No Answer	4	2.2
	<u>185</u>	<u>100.0%</u>
Do you have a driver's license?		
Yes	175	94.6
No	10	5.4
No Answer		
	<u>185</u>	<u>100.0%</u>
How many automobiles available in family?		
None	16	8.7
One	95	51.4
Two	67	36.2
Three	6	3.2
Four	1	.5
Five		
Six		
Over Six		
	<u>185</u>	<u>100.0%</u>

If you have a license, was an automobile available for your use?

Yes	147	79.5
No	27	14.6
No Answer	<u>11</u>	<u>5.9</u>
	185	100.0%

How often do you take the train?

Daily	172	93.0
Twice a week	4	2.2
Other	9	4.8
No Answer		
	<u>185</u>	<u>100.0%</u>

What is your age?

Under 14		
15-19	5	2.7
20-24	27	14.6
25-34	65	35.1
35-64	80	43.3
Over 65	8	4.3
No Answer		
	<u>185</u>	<u>100.0%</u>

What is your sex?

Male	95	51.4
Female	90	48.6
No Answer		
	<u>185</u>	<u>100.0%</u>



APPENDIX N
Brockton Area Transit Study

Staff Paper No. 9
Guidelines for Developing a Transit Information System
in the
Brockton Area

February, 1975
Old Colony Planning Council
City of Brockton
Urban Transportation Systems Associates, Inc.

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The material herein used was derived from a preliminary report of the New York Department of Transportation's Planning and Research Bureau entitled, Guidelines for Developing Transit Information Systems, August 1972.

I. Introduction to a Transit Information System: Its Purpose.

A transit information system herein is defined as a collection of people, procedures, a data base and a system organized to develop the information required to fully inform the user and potential user about the transit system. This report will address itself mainly to the data, procedures, and system by which users get information. It will address the peoples' problems only in certain specific areas.

In addition to discussing and making recommendations along these lines the report will identify budget needs for this system's operation. As a basis for recommendations concerning these information materials, the transit patron's needs and capabilities will be examined in detail.

Information Needed for a Transit Trip Making

A potential patron wishing to make a transit trip must know:

- 1) The origin and destination of the transit route(s) which he may use,
- 2) Arrival and departure times for his trip,
- 3) Fares
- 4) Possible boarding locations, and
- 5) How to identify the transit vehicle which he must take.

One of the first tasks facing an individual when planning a transit trip is to determine whether service exists between the end points of his trip. In establishing this he must determine which route or combination of routes comes closest to connecting his origin and destination. A transit map having a complete street plan of the area as a base is an effective graphic means of presenting this origin and destination information. (This map is discussed in Chapter II). However, because of the amount of detail that is contained on such a transit map, it is usually large and cumbersome, which suggests that additional more portable origin-destination materials be part of the transit information system. Route descriptions and transit maps having less detail (often called schematics) are common alternate sources of origin-destination information. (This map is discussed in Chapter III)

Having discovered that it is possible to make his trip by transit a potential patron is usually interested in the various times associated with his trip. Departure time from his origin, the waiting time involved in transferring to another vehicle, arrival time at his destination, and total trip time are all pieces of information required by a potential patron for deciding if transit will fit his needs. An expansion of the traditional timetable, which simply indicated the times at which vehicles departed from the origin of the route, to include departure times from intermediate stops can aid a patron in estimating all required times for his trip. (This schedule is discussed in Chapter IV)

In addition to time and origin-destination materials, a potential patron also needs certain practical information to complete a transit trip. The fare involved in the trip, any peculiarities about fare (such as correct change required), the points at which he may board and alight from a transit

vehicle, and how to recognize the vehicle he must board, must be known to him if he is to make his transit trip successfully. Fare information can be printed on all information materials and can be posted on buses and in shelters; bus stop signs and shelters best indicate the points at which a patron may enter or exit a transit vehicle; and destination markers (roller screens) on transit vehicles indicate to the patron the route followed.

The materials discussed thus far should, when used together, be sufficient for answering patrons' questions about transit trips. However, there is an information device, a telephone information service, which can provide a patron with any transit information that he seeks. A sizable portion of patrons may not have access to one or more of the afore mentioned information sources when planning a trip. This lack of information may deter a potential patron from making his trip by transit. For this reason a telephone information service seems a worthwhile, though costly, expenditure for Brockton Area Transit (BAT) to make.

In this discussion, transit maps, schedules, bus stop signs, a telephone answering service and destination markers were indicated as informative devices which can provide a potential patron with all the information needed for making a transit trip. Each of these devices can be thought of as a component of a complete transit information system. Each component has a specific value of its own and, together with the other components, forms a comprehensive transit information system which can provide needed information to a broad spectrum of potential transit patrons. In some instances several components are suggested for presenting the same information. This is done in the awareness that potential patrons differ in their preference for and ease in which they may handle various forms of information. The redundancy of information is necessary to assure BAT that the facts being presented are comprehensible to a wider segment of potential patrons than would otherwise be the case, and to reassure the patron that his information is correct.

In this report each of the components and their relative importance will be discussed in some detail. Wherever applicable, recommendations for features that will enhance the informational content of the components, developmental considerations, distribution techniques, and costs will be discussed.

II. Comprehensive Transit Map

The primary purpose of a comprehensive transit map is to aid patrons in identifying the transit routes that they may use to make their intended trips. The comprehensive map must serve this purpose for every potential rider, be he a regular transit user, a new patron, or a visitor to the area. Accordingly, the designer of the map cannot assume that its users are familiar with the area served; thus a detailed street plan of the area, showing major activity centers and selected points of interest, should serve as the base for the comprehensive transit map.

Fundamentally, the comprehensive transit map has two components: a street map of the area served, and a diagram of the transit system which is superimposed on the street base map.

A. Base Map Design and Development

For the first year of operation of BAT, it may be that a map covering Brockton only would be needed. On the other hand, in order to show people throughout the region their relationship to the existing service as well as to show intercity service, MBTA service, and connecting rail service, a regional base might prove attractive.

It appears, therefore, that a map should show the Brockton Area Transit region¹ on one side in a small scale (1" = 3,500'), and the city of Brockton on the second side in a larger scale (1" = 1,250'). The second side should also include a map inset of the Brockton CBD (Central Business District) at a still larger scale (1" = 500'). The map size will be approximately 25" X 25", based on the above. The base map information of streets, street names, and points of interest must be subdued, whereas the transit routes must be highlighted for the map to properly serve its intended purpose.

On the regional side, it is proposed that if including all streets in the region crowds the background, only major roads and streets be included. On the city side, all streets should be included in both the city map and the CBD inset.

Lettering: The size of type used for identifying streets and points of interest on the base map must be large enough to be legible, yet small enough not to interfere with route information. It is suggested that street names be in 6-point type, while points of interest be in 8-point type. Transit route information might be best identified by using 10-point type.

Streets and Points of Interest: The regional scale map might use the "line" technique for streets, while the city and CBD base streets might be "double-line" as on the present city map, which could possibly serve as a base for this. The lettering of street names should be above and to the left of the appropriate lines. The U.S. Census, Brockton Urbanized Area portion of the Metropolitan Map Series for the Eastern Massachusetts Area maps should be considered, as well as the Massachusetts Department of Public Works' County

1 including Avon, Brockton, Bridgewater, East Bridgewater, Easton, Stoughton, West Bridgewater, and Whitman

Series maps, for possible regional base maps. Uniform cartographic symbols exist for many types of activity centers such as parks, airports, historical sites, and other points of interest. A complete table of these symbols can be found in the "Report on Uniform Map Symbols" (AASHO, 1962).

B. Transit Route Overlay

The techniques employed in developing the diagrams of the transit routes for the comprehensive map must be designed to increase the legibility of the transit information on the map, and to reduce competition between transit and base information.

The transit routes on the comprehensive map should be easily distinguished from base information. The need for this distinction implies that a separate, contrasting, and more intense color than is used for the base map be used to print the transit routes. This bi-color or multi-color printing requires a press run for the base, and a separate run for each color used to print the transit routes, consequently a map overlay of the transit routes must be developed separately from the base map. The plate which is made from the transit route map, is then used to print an "overlay" or "color overprint" for the base.

Route Designations: On the transit overlay, each route is delineated in its entirety and is identified by its appropriate route symbol. The route symbols or designations should be enclosed in some geometric figure (e.g., the circle is recommended), and affixed to the appropriate route line:



In areas of concentrated transit service, this affixing of symbols to lines avoids confusion as to which symbol applies to which route line. Route designations should not be written over base information since overwriting impairs or obscures both base and route information. Whenever possible, base information should be shifted to make room for the transit symbol; or the route designation should be moved to some nearby point where it will not interfere with the base designation.

In addition to their use as route identifiers, route designations can also be used to show the direction which a route takes. To avoid confusion about the path followed by a transit route, symbols should be placed at appropriate intervals along the route lines. These extra symbols are especially needed in areas following points at which two or more transit lines cross. For routes which cross themselves, however, directional arrows can be more helpful in identifying the path of the route.

It will be necessary to prepare a key between the route numbers and route names so that those patrons who utilize route names for identification may follow the route easily.

Distinguishing the Routes of Various Transit Companies: In the Brockton area it will be necessary to distinguish between the MBTA, Almeida, the Brockton Transit Authority, and any other operators. Since transferring will generally

not be permitted, it is important that a patron be able to distinguish the routes of each company from the others on the map.

Since color separations increase the cost significantly, it is recommended that the route number plus line type (width of line or dashed line) be used to identify different companies. It is recommended that only one color separation printing be made in addition to the base color printing. It is also recommended that squares be considered for route number designation for companies other than the Brockton Transit Authority, which would use circles. A map key will be needed to distinguish these different symbols and lines.

C. Supplementary Information

CBD Inset: The CBD inset which will go on the same side as the Brockton city map, will utilize all the symbols and colors discussed heretofore. The inset area from which the CBD inset was taken will need to be shown in such a way (half-tone in color around the edge) that the patron can relate the inset to the city map. The same applies to the regional and city maps; the place where the city map sits on the regional map can be shown in half-tone color as well. The inset route taggings have to be related from the insets to the larger maps in each case so that it is clear to the patron in locating a route on the inset and finding it on the larger map.

Street Index: Another very useful feature which is common to most comprehensive maps is a street index. Generally this is an alphabetical listing of the streets in the area displayed on the map. These streets are keyed to a rectangular grid which is superimposed on the base map. There, each street is listed with the coordinates of the square in which it lies. It is recommended that over the longer term, inclusion of a street index be seriously considered. In order to keep the present task manageable, it is recommended that no street index be included at first.

Route Description: Route descriptions provide an alternate source of route information for people who have difficulty in reading maps, and are often necessary to determine the exact streets followed by the transit line whose inbound and outbound trips differ, or by routes having several branches. Depending upon room available on the borders of the maps, it is suggested that route descriptions include the terminal points and sequence of streets traversed by each route. If space permits, each description can give a sequential list of the points of interest and the major traffic generators passed, as well as a description of service which would include usual headways and running times.

Miscellaneous Information: Certain additional information should be included on this comprehensive transit map:

- the name of Brockton Area Transit and its logo,
- its address and telephone number,
- the information center telephone number, and
- the period of validity of the map.

This above information should be printed in Spanish as well as in English.

D. Production

In addition to being dependent on the criteria treated in the previous sections, the effectiveness of the final transit map relies heavily on the materials employed in its production. The type of paper used, the method of reproduction employed, and the colors used in printing are all factors which must be considered in producing the comprehensive transit map.

Paper: A comprehensive transit map should be both functional and durable. Since such a map usually requires little change during a year, the paper should be strong enough to withstand wear over a long period of time. In addition, this paper should be flexible enough for folding, and opaque enough to allow a two-sided printing. A paper having a basic weight of between 40 and 60 pounds, and having a rag content of 22 to 50% will fill these needs. Some sulfite papers with the recommended basic weight may be adequate for the map, although they contain no rag. If it is likely that the routes will change more quickly - after six months - and that the map will be reprinted more often, the paper weight can be reduced. In this case, the printer can aid in selecting a suitable paper for the job.

Reproduction Methods: Photo offset is recommended as the most efficient reproduction method for the map. Photo offset is one of the most accurate, permanent, and attractive printing methods available. For the size and quantity of maps to be printed, this method should prove more efficient and economical than any of the other common printing methods.

Color Printing: To aid a patron's perception and assimilation of the transit information contained on the comprehensive map, a high level of contrast between the base map and the transit overlay should be sought. Remembering that the information given by the transit overlay is of primary importance, and that the base information is available essentially for orientation purposes, the contrast should be of such a nature that the base map appears suppressed or subdued when compared with the transit routes. Color plays an important part in this process. Studies have shown that a light color paired with a dark color will be overshadowed; specifically, a light yellow-black combination provides the best example of this. Therefore, when choosing colors for printing, the base should be a light color (light gold, yellow, tan, green) and the transit routes should be a dark color (dark green, black, deep red, deep brown). Using this technique, the transit information on the map will be predominant, and the base information will appear recessed.

A final word about the use of color as it pertains to production: map makers are cautioned against using too many colors when printing a transit map. Although the use of color may greatly enhance the effectiveness of the map, multi-color printing can be costly. While color is very important for making distinctions on a map, benefits gained in color printings must be weighed against budgetary restraints. We strongly recommend using at least two colors (which could be tied in with the colors in the logo design and the chosen bus colors), one for the base map, and one for the transit lines. Additional colors can raise printing costs by as much as 25%.

E. Development and Production Costs

The cartographic costs involved in developing this comprehensive transit map

from the basic raw materials described so far depends on whether one of the existing base maps is adaptable, or if a new base map has to be drawn. If one of the existing bases can be used, cartographic work should amount to about four weeks at \$300 per week for a draftsman/cartographer plus blow-ups and materials of \$100 or about \$1,300 in toto.

The printing costs involved in producing a 25" X 25" comprehensive transit map in 10,000 copies (first printing), on 50-pound paper with 25% rag content, on two sides, in two colors are estimated at \$ 200.

F. Distribution

For the transit map to be effective and for its informational value to be realized, it must have a wide distribution. If funds are available, a mass mailing is the best means of insuring that transit maps will reach all households in the area. Advantage can be taken of the reduced bulk mailing rates. Since OCPD has a bulk mailing permit, this could be utilized easily. This mailing permit can be applied to any bulk mailing undertaken by BAT, and need not be used solely for distributing the comprehensive map.

Maps printed on 50-pound paper at 25" X 25" weigh about 1.1 ounces. In addition to mass mailing, BAT should investigate the possibility of enlisting the cooperation of local merchants and managers in placing map racks in strategic shopping areas, financial institutions, hotels and motels. Schools and organizations, especially elderly groups, can be asked to have maps available. Permission to post a map in public places served by transit, such as theatres, department stores, and shopping malls, should also be sought. Welcome Wagon, real estate, and renting agents could also be requested to distribute transit maps to newcomers in the area. All employers should be encouraged through the Chamber of Commerce to distribute and have posted transit maps.

In each case, it is assumed that the maps are distributed free of charge.

III. Schematic System Map

It is unlikely that the transit patron will carry the comprehensive map with him for reference. The size of the map makes it cumbersome to be used conveniently away from home, office, etc. However, people are often in need of the origin-destination and transfer information provided by a comprehensive map while away from such places. A more portable information tool which pictures the transit system in its entirety, displays the inter-connection of routes clearly, and is functional "at the bus stop" is called for in an information system. A simple line map or schematic transit map fills this need. A system schematic is a map of the entire transit network on which each transit route is represented by a line which is tagged by its appropriate symbol, the major streets traversed by each route are labelled, and some base detail is included for orientation purposes. In contrast to the comprehensive transit map, the schematic map should contain a minimal amount of base detail, selected major streets and points of interest which are widely recognized, so that it can be printed on a smaller size paper without fear of crowding. Simplicity and compactness should be the distinguishing features of the schematic system map. However, it is cautioned that despite the desirability of having such a "portable" information tool, patrons not familiar with the area may have difficulty using this map.

A. Development

The recommendations for route tags, print size and designations of points of interest discussed in Chapter I are applicable to the schematic map. There are several problems in these areas, however, which are unique to the schematic map. Specifically, the schematic map should be designed for simplicity and portability. This implies that the map must be printed on a small, easily handled piece of paper. Two problems in clarity arise because of this. First, we mentioned in Chapter I that it may be difficult for a patron to tract a transit route in its entirety on a transit map. This becomes most difficult in areas immediately following the intersection of two or more routes. In Chapter I we suggested placing route symbols at appropriate intervals along the route line as a solution to this problem. The smaller size of the system schematic map, however, may make this extra tagging impossible without sacrificing clarity and legibility. A judicious use of directional arrows, however, can provide a solution to this problem in most cases.

A second problem in clarity may arise as a result of attempts to depict routes having numerous bends and turns. Because it is desirable to print the schematic map on a reasonably small sheet of paper, this "smaller" paper size may cause crowding and obscurities on the map if an exact scale representation of each route is attempted. In such cases bends and turns in a route are better displayed as straight lines. Using only horizontal, vertical, and lines at approximately a 45° angle, can add to the clarity and legibility of the map with only a minimal sacrifice in precision.¹

1 Maxwell School, Improving the Transit Information System in Syracuse, New York, Technical Paper No. 70-1, Syracuse University Urban Transportation Institute, 1970, p. 11

Paper Size and Scale: As just mentioned, it may not be desirable for the schematic map to be produced exactly to scale, although some relative idea of distance should be apparent from this map. Thus, it is not relevant to suggest a cartographic scale for the schematic system map; for purposes of portability the recommended size is approximately 8½ X 5½, and the route structure should be diagrammed to fit onto this size sheet of paper. The scale will need to be somewhat distorted, but that is not too important.

Supplementary Information: Since the schematic map should be simple and printed on small size paper, we suggest that information presented to supplement this map be kept at a minimum. However, some supplementary information is necessary for efficient use of the schematic.

Once again there may be obscurities in sections of the city enjoying good transit coverage. In general this problem arises in the core or central business district of the city. Since legibility is usually hampered in this single area alone it is not necessary to resort to larger paper to alleviate the situation; rather an enlargement of the CBD can be developed separately and printed on the reverse side, or in its own panel with the schematic map. The physical layout and identifications used here should be consistent with those used on the system schematic. The guidelines set forth in Chapter I for developing a CBD inset are again applicable.

We also recommend that, as on the comprehensive transit map, a legend pairing each route symbol with the route name appear with the schematic map for the benefit of those patrons who identify routes by name rather than by symbol. In addition, a cover panel showing the Brockton Area Transit name (or logo), the telephone information service number, and the period of validity for the map should be included with the schematic.

B. Production

The recommendations in Chapter I on reproduction methods and, to some extent, those on paper weight are applicable to the system schematic. The weight and strength of the paper used for the schematic again will depend on the need for opacity and on the length of time for which the map must last. If the transit authority plans to issue this map infrequently (less than yearly) a 40-60 pound basis paper with 25-50% rag should be used. If, on the other hand, the map is distributed three or four times a year, a simple 40 pound offset paper might well suffice.

With respect to color, since there is little base information on the schematic map, there is usually no need to distinguish base from transit information by color. Thus a one-color printing is adequate for the schematic map.

There is an additional point about the printing of a schematic map which should be discussed here. The schematic system map per se requires just one side of paper for printing. However, as will be mentioned in Chapter III, there are certain advantages to printing route schedules on the reverse side. If the schematic is the correct size for this, it becomes a more useful information tool when printed with schedules. This combined document provides a patron with a total picture of the transit system as well as the time and

transfer information for his desired route. However, additional copies of the schematic should be printed apart from schedules to ensure wider distribution. From a production viewpoint, since it was suggested that the entire reverse side of the schedule be used for the schematic, a new plate need not be made for this separate printing.

C. Development Costs

The development costs associated with the schematic transit map depend upon the number of routes to be drawn, the amount of detail to be included, and the kinds of supplementary information to be presented with the schematic map. It will probably cost about \$300 for a graphics specialist to design a schematic map having about ten routes, a little base detail, a CBD inset, and a symbol/name table.

D. Distribution

In addition to the methods of distribution discussed for comprehensive maps the system schematic lends itself to unique forms of distribution. Because of its size, simplicity, and structure, this map can easily be printed in the telephone directory. Transit companies in Washington, D.C., Providence, Rhode Island, and Oakland, California have used this distribution technique quite effectively. The telephone company may be willing to do this printing as a public service and at no charge to BAT.

The system schematic might also be printed in the local newspapers as part of a promotional campaign or as an information service of BAT. In addition to ensuring BAT that the schematic map is available to almost all area residents, a regular printing keeps the public aware of the transit system in the area. Since newspaper copy is not durable, however, this copy will only be kept for a limited time; hence BAT might well consider having a newspaper printing at regular intervals or having a less frequent newspaper insert printed on special paper.

IV. Schedules

Essentially the transit patron needs these various pieces of time information:

1. the times at which a transit vehicle will arrive at his bus stop,
2. the time at which he may expect to arrive at his destination,
3. the waiting times involved in making any necessary transfers, and
4. the time involved in waiting for the next scheduled vehicle in the event that he missed his bus.

There are several ways of presenting the patron with this information. In this Chapter we will examine the more common of these, and make recommendations for their development.

Brockton Area Transit should use a combination of the features discussed in this Chapter to form a single "time document" or schedule for each route. The resulting route schedule should be a portable document which is aimed at providing answers to any of the time-related questions about a route which might be posed by a transit patron.

In this Chapter we will also suggest a format for a route schedule which we feel will meet the requirements of BAT and will suggest methods of producing and distributing schedules.

A. Timetables

The traditional timetable, which lists the departure times of vehicles from the origin of a route (for both inbound and outbound trips), must be part of every route schedule. The route timetable tells the patron how often he may expect a transit vehicle to arrive at his boarding point and gives him a general idea of the times at which he may actually board the vehicle. Although developing such a timetable may seem a simple task, there are many details which must be attended to if the timetable is to be legible and easy for patrons to use.

Many of these details result from the time make-up and structure of the routes by BAT. To make timetables easier to understand, distinctions on the route timetable often need to be made whenever service varies:

1. between weekday and weekend service along the route,
2. between morning and afternoon service, and
3. between the various branches or spurs of a trunk route.

In addition to making these distinctions, special care must be taken so that the timetable itself is clear and readable. This, of course, raises questions of print size and character spacing. In this section we will examine methods of treating these common problems.

Weekday-Weekend Service: In most urban areas, service along a route is usually more comprehensive on weekdays than it is on holidays and weekends. This difference in service requires that some distinction between weekday and weekend departure times be made; the nature of this distinction depends on how drastically these departure times differ.

For routes where weekend departure times coincide to some extent with those of weekdays, a single timetable can display departure times for the entire week. A simple example of this is a route on which vehicles leave every one-half hour on weekdays and every hour on weekends. Here, every other departure time will apply to both weekday and weekend runs. A single timetable which distinguishes the common departure times from the rest is all that is required in such cases. Bold face or a second color can be used to print the common times; the use of any such distinctive feature, however, must be fully explained on the schedule to avoid confusion.

For routes having greater differences in weekday and weekend times, separate timetables must be used to make this distinction. These distinct tables must be clearly labeled and should be exhibited in separate areas of the route schedule.

Morning and Afternoon Service: Distinction between A.M. and P.M. times is a critical matter and yet the small amount of effort required to make this distinction can reduce ambiguity and lessen a patron's chances of misunderstanding the information presented on the timetable. Again, bold face type can be a useful device for making this distinction. Alternative techniques for making this distinction include dividing the timetable into two columns, one labeled A.M. departure times, and the other P.M. departure times, or using different print type for A.M. times than that which is used for P.M. times. This last suggestion lends itself well to situations in which schedules are printed in-house, since it merely requires that two typewriters having different kinds of type face be used to make the master copy of a route schedule.

Termination Spurs: BAT may occasionally provide service along a trunk route which ends in several different termination spurs. Fundamentally, these routes are the same throughout most of their length separating only on their final circuit. While this allows transit service to a wide area, it may be confusing to patrons; however, because these routes are essentially the same, separate timetables usually are not developed and printed for each branch. Rather, departure times are included on one schedule with some distinctive mark (letters, etc.) made to indicate which branch a particular run will take. These distinctive marks must be included with route numbers throughout the information system (specifically on maps and destination markers) to avoid any unnecessary confusion of patrons. This practice is extremely effective from a production viewpoint since space is saved and production and distribution costs are less than they would be had separate schedules been made. Nonetheless, because of the extra notation required to distinguish termination spurs, we recommend that a single timetable be used to show no more than three or four spurs. The use of a single timetable for more than this number of spurs may decrease its legibility significantly.

If one timetable is used for such a route, BAT must explain how the various branches on a route differ. Route descriptions and route diagrams are the most common ways of presenting this "explanation". At least one of these should be presented with the timetable so that a patron will be able to determine which branch will take him to his destination and the times at which he may expect a vehicle traveling this spur to arrive.

Print Size and Spacing: In addition to the problems in developing legible timetables which result from the nature of the transit routes, there are certain other factors which affect the clarity and readability of timetables. Essentially, entries in the timetable must be large and well spaced so that they can be easily read by all transit patrons. We feel that this requires timetable entries to be printed in at least eight point type with a columnwise maximum of six entries per inch.

Transfer and Intermediate Time Information: Many transit riders board or depart a route at points other than the route's origin or destination. For these people, especially those who board or depart at some distance from the origin of the route, the traditional timetable can give only a general idea of the times at which they should expect a vehicle to arrive. To adequately serve these patrons, a schedule must provide them with sufficient additional information so that they may determine approximately when vehicles will arrive at their boarding points. The method involved expands the timetable to include the departure times of vehicles from selected intermediate points along the route. The number of points which should be included for each route depends, of course, on the length of that route. However, when choosing these intermediate points, major intersections and transfer points should have priority. The inclusion of transfer points in this list has the added advantage, when used in conjunction with the schedule for the transfer route, of providing the patron with information on how long he must wait to make his transfer. We suggest that whenever possible, the selected points should be chosen so that the maximum time between listed stops does not exceed ten minutes. This should be sufficient to allow a patron to determine with a good degree of accuracy the arrival times of vehicles at his location.

B. Schedule Format

A route schedule should be small enough for a patron to carry with him. Its final dimensions should be such that it fits easily into breast pocket or purse. Moreover, for economy, schedules should be printed on some standard size paper with dimensions of 8½" X 5½", 8½" X 11", or 8½" X 14". These sizes of paper, when folded into three or four panels, satisfy both these criteria and, in most cases, allow sufficient room for printing all necessary information.

Below is a sample schedule format:

Campello

Outbound Lv M & S to Big G	Inbound Lv Big G	Lv M & S	To
6:00 AM	6:15	6:30	Montello
6:15	6:30	6:45	Center
6:30	6:45	7:00	Westgate
6:45	7:00	7:15	Ames
7:00	7:15	7:30	Montello
7:15	7:30	7:45	Center
7:30	7:45	8:00	Westgate

Montello

Outbound Lv M & S To Montello	Inbound Lv Avon Line	Lv M & S	To
6:00 AM	6:15	6:30	Campello
6:15	6:30	6:45	Westgate
6:30	6:45	7:00	Ames
6:45	7:00	7:15	Center
7:00	7:15	7:30	Campello
7:15	7:30	7:45	Westgate

Lv = Leave

M & S = Main and School Streets

Big G = Supermarket

V. Signs

A potential transit patron must be able to determine where he can board a bus and must be able to recognize the bus he should board. Signs provide the patrons with this information. On one hand, bus stop signs signal the points at which buses can be boarded, while the traditional roller designation signs on buses indicate the route travelled. Signs can also be used to provide patrons with information about changes in the transit system, origin-destination information, facts about fares, and so on. In this Chapter we will examine the purpose and features of bus stop signs and destination signs in some detail, and will discuss several secondary signs which can be included in the information system.

A. Bus Stop Signs

Bus stop signs traditionally have had the purpose of telling patrons where to board buses and usually have the regulatory purpose of keeping autos from

parking at bus stops. While both these functions are necessary, a patron usually needs specific route and transfer information at the bus stop. For BAT, which is interested in developing a comprehensive information system for the convenience of its patrons, the bus stop sign provides an ideal place for providing "on the spot" route and transfer information for the routes serving the stop and, where economically feasible, schedule information for these routes. However, this requires a change in emphasis and format from the traditional regulatory "Bus Stop, No Parking" sign to that of a sign whose major purpose is to provide transit information.

Route and Transfer Information: While a patron engaged in making a transit trip must know where he can board transit vehicles, he must more specifically know where he can board the particular route which will take him to his destination. Bus stop signs signal the points at which transit vehicles stop for passengers to board; these signs can also be used to indicate which routes can be boarded at each stop. There are several methods for exhibiting this route information on a bus stop sign; briefly these are:

1. posting the symbols of the route serving the stop on the sign,
2. including a route description of each route serving the stop with the sign, and
3. including a schematic of the routes serving the stop with the sign.

Based on an analysis of these three options, it is recommended that only the first option be utilized in the Brockton area. It is suggested that with changes in routes likely, posting of detailed route descriptions and schematics may require a heavy investment in updating the information on the signs, whereas it would be relatively unlikely that all bus stops on a route would change. If a route is moved over a block, only the bus stop sign with its route marker intact need be moved; no other changes to the signs are necessary. But if a route description and schematic is displayed, they all have to be changed throughout the route.

Schedule Information: Schedule information also may be needed by patrons at the bus stop. This need is particularly acute at transfer points since patrons may not always have access to the schedule for routes to which they must transfer. If a patron can determine that he has several minutes before making his connection, he might be able to run an errand instead of impatiently waiting and wondering when the next bus will arrive. Additionally, if such schedules are strictly kept, this is an excellent way of continuously reinforcing patrons' confidence in the reliability of the BAT schedules. Thus, the posting of schedules with bus stop signs at major transfer points provides patrons with information which can add to the convenience of making their trip by transit.

It is suggested that schedules be posted only at major transfer points. These schedules must be protected from the weather as well as from vandals. It is suggested that heavy plastic or unbreakable glass be used to house them as well as schematic system maps.

Physical Features of Bus Stop Signs: It is primarily the purpose of this section to describe the graphic features of bus stop signs which will add to

the quality of their informational presentation, rather than to consider the actual physical production and manufacture of bus stop signs. Correct use of features such as lettering, distinguishing shapes and symbols, color, and the size of the sign may, however, add to the informational value of a sign, and therefore, can be considered in an "information context".

- Letter Size: A bus stop sign must be readable by and intelligible to its users. For the patron at the bus stop this implies that the sign must be printed clearly and have all information well labeled. But more than this, a bus stop sign must be readable at a distance, that is, each symbol, letter, or number contained on the sign must be identifiable. From at least half a city block, or between 100 and 200 feet, a patron should be able to read the route symbols on the transit sign and so determine that he is heading in the right direction¹. Such features as letter spacing and style, the ratio of the width of each letter to its height, letter size, color contrast, and illumination are all integral components in making signs legible at a distance².

It is recommended that the letters be 3 inches in height to insure that they are seen at the required distance.

- Distinctive Features: Bus stop signs by their very existence convey information. If a sign is distinctive, people will know without reading it that this signals a point at which buses may be boarded. An unusually shaped sign or one bearing a distinctive symbol which comes to be identified with "bus stops" can be as effective in giving this information as are the words "Bus Stop". Elongated hexagons, circles, and pentagons might be considered for use as bus signs. However, production costs may be greater for these special signs than for the more standard rectangular sign, and, because of their configurations, space which might otherwise be used to present information is wasted.

A symbol that is associated solely with the transit system, the picture of a stylized bus, or the letter T, for example, can also serve to distinguish bus stop signs from other signs. In several cities, standard symbols have been adopted by transit systems. If such a symbol is placed on a sign and is visible at a distance, this will have the same effect from an informational standpoint, as does a distinctively shaped sign. This symbol should be visible from a distance of at least half a city block.

It is recommended that either the logo selected or some common symbol be adopted for use on a standard rectangular sign.

- Color and Size: The distance from which a bus stop sign is visible and from which its contents are readable depends largely on the size and colors of the sign. If there is a high degree of color contrast between the background of the sign and the symbols and/or letters on the sign, the symbols will stand out from the sign and will be visible from a greater distance. Combinations such as blue-white, green-white, blue-white-red, or blue-white-

1 Washington Metropolitan Area Transit Commission, Transit Information Aids - Mass Demonstration Project INT-MDT-10, Final Report, 1969, p. 31.

2 For a complete treatment the reader is referred to Human Factors Engineering by Ernest McCormack, McGraw Hill, New York, New York.

black will serve well in most instances and do not conflict with the standard signs such as "yield", "stop", etc. (BAT should be cautious when choosing colors that these are not the same as the colors used on the new international highway signs which are gaining increased acceptance in the United States).

In the three color combinations, one color (the lightest and least intense) should be used for the background, one for the transit symbol, and the third, (possibly the darkest and most intense) for the lettering in the words "Bus Stop".

The size of a bus stop sign depends upon the amount of information which it must contain and the distance from which it must be visible. In general we feel that a sign approximately 18" X 24" (the dimensions of a standard "One Way" sign) should serve most situations well. The top half of this sign could be devoted to the transit symbol and the words "Bus Stop" and the lower half to some form of route information.

- Priorities for Stop Sign Information: Ideally, a sign will have all the features discussed in this section: route information, the words "Bus Stop", a distinctive symbol and/or shape, and, at transfer points, schedules for the routes serving the stop. Practically, however, budgetary restraints may prohibit such extensive signs. When this is the case, BAT must evaluate which of these features can best be eliminated. It is recommended that each sign contain the words "Bus Stop", a recognizable symbol, and a list of the routes serving the stop.

B. Signs on Buses

Generally bus stop signs are the first thought of and the most significant signs within a transit information system. However, there are other signs which are carried on transit vehicles and which provide patrons with much-needed destination information or information about changes affecting transit service. Foremost among these signs are the traditional roller destination markers which identify the route followed by a vehicle. Other less common devices for giving passengers information on the bus include maps and notices within the vehicle itself.

Destination Markers: A patron wishing to make a transit trip must be able to recognize the bus he wishes to board. The standard roller or destination sign at the front of each bus provides this information for people waiting at the bus stop and for those approaching the bus from the front. At a minimum these destination signs should contain the number and the name of the route traveled by the vehicle.

Signs conveying this information should also be placed at the side of the vehicle to assure the patron approaching from the rear of the bus that this is or is not the bus he wishes to board. Such information is a convenience to the patron, telling him that he just missed his bus and so might make that quick errand, or that he should run to make his bus. These side destination signs need not be as extensive (or expensive!) as the front roller signs since their primary purpose is simply to assure the patron that he is approaching his desired vehicle. A simple plate showing the route's symbol and extending from the side of the bus will serve this purpose adequately. In

authorities where buses are arbitrarily assigned to routes, these plates could be placed in metal strip cases attached to the bus. This will allow the driver to change route symbols as needed.

It is recommended that the symbols on the marker be at least four inches in height and that contrasting colors be used for the symbol and the background.

Signs Inside the Bus: Another class of signs, having somewhat less importance but still useful to the transit patron, are those mounted inside the transit vehicle. There are three common sign types that are utilized in this manner:

1. transit notices,
2. the transit schematic, and
3. the route schematics.

Transit notices containing pertinent information about special or new services, route and schedule changes, or other changes can be posted on advertising panels or on windows inside the bus. We stress at this point that BAT must keep its patrons informed as to changes in service and in any of the information provided them. The bus interior provides an ideal place for informing patrons of such changes at a minimum cost to BAT.

The second type of internal sign that should be considered is the schematic system map. The aforementioned format of this map permits it to be mounted on the panel directly behind the driver. This map can provide on-the-spot information to the patron at little extra cost, and should reduce the interaction between patron and driver.

Lastly, an enlarged schematic of the route traveled by the transit vehicle, showing all bus stops and transfer points, may be posted on the bus. This suggestion is particularly applicable to authorities where the same bus is assigned to a given route on a regular basis. If numbers 2 and 3 are not possible because buses are assigned to routes indiscriminately, at least the driver can carry system schematics and route schematics as well as schedules which he can hand out to patrons.

Priorities for On-Bus Sign Information: Destination markers are necessary for every transit information system. Through these simple devices patrons can recognize the transit vehicles serving the routes which they wish to board.

On the other hand, the internal bus signs discussed here are not critical to the information system but do allow BAT to provide additional information for the convenience of its patrons. We feel that transit notices are the most important of these devices, providing patrons with information needed to update the materials distributed to them. Which of these maps suggested here should take precedence over the other would be a decision for BAT to make. It is however, recommended that all Brockton Area Transit buses have a system schematic posted.

VI. Telephone Information Service

A telephone information service can be a two-directional source of transit information providing answers to patrons' questions about transit service and giving BAT valuable information about the performance of transit routes as viewed by the public. A telephone information service is needed to answer the questions of potential patrons who are unable to use or to obtain up-to-date maps and schedules. In addition to giving origin-destination and time information, telephone clerks must be prepared to answer questions on fares, boarding locations, the use of printed information and all other questions which arise when a potential patron is planning a transit trip.

Besides providing information, telephone clerks should be trained in recording and handling customer complaints. Although most calls to a telephone service will be requests for information, it is imperative that a customer be aware that his complaints (or commendations) about the transit system can be heard through this channel. Aside from providing an outlet for customer frustrations about the system, and so stemming possible customer loss, this is a valuable, personal way for BAT to obtain feedback from the public about how the system should be improved.

In this Chapter we will examine the specific needs involved in establishing a telephone information service.

A. Personnel Requirements

The number of information clerks needed to staff a telephone service depends upon the volume of calls received. Based on the experience of other much larger operations (see table of experience following), it is estimated that about 50 calls per day might be made to a telephone information center. Factors such as the number of passengers served, the number of hours during which the telephone center is open, the quality of transit service, and the attitude of BAT (encouraging or discouraging patron use of the telephone information service) will influence the number of calls received.

<u>Company</u>	<u>Average Daily Volume of Week- Day* Calls</u>	<u>Operating Hours For Telephone Service</u>	<u>Approximate Fleet Size</u>
1	600	4 AM - 7 PM	125
2	700	7 AM - 7 PM	170
3	860	24-hour service	215
4	800	7 AM - 8 PM	235
5	1980		280
6	725	24-hour service	280
7	1400	8:15 AM - 5 PM	485
8	60**	24-hour service	515
9	3500***	24-hour service	690
10	2400		1050
11	2500	6 AM - Midnight	1200

- * With respect to weekend calls, from our limited data we would expect Saturday calls to be about 80% and Sunday calls to be about 60% of those received on weekdays.
- ** That the daily number of requests for information is extremely low for this company is partially explained by the fact that most routes in this company operate on very short headways thus reducing the patron's need to call for schedule information.
- *** The volume of calls to this company is very high compared to that of the other companies surveyed. However, this company actively encourages its patrons to call for information employing many techniques to make this service convenient and desirable for patrons to use.

Generally, an information clerk should be able to handle about thirty calls an hour; Brockton, therefore, needs only one clerk if it sets up a telephone information center. It might be that the regular personnel will be able to handle this function along with other duties. In any case, it is recommended that this center be established on a very flexible basis with initially small staffing and funding.

It is important that the clerk or other person assigned to handle this task has good experience in dealing with people. This clerk will also be expected to receive complaints, and to respond to a broad variety of questions.

B. Information Aids for Information Clerk

It is unreasonable to expect a clerk to know or to remember all the specific details of each route in the transit system. Therefore, BAT must provide sufficient information aids to allow the clerk to answer questions posed by callers. Essentially, patrons will seek the same kinds of information as prompted the development of the materials discussed in the previous chapters of this report. The clerk should be able to determine from these aids, the answers to questions on origin-destination, time, fares, and boarding points along a route.

One question frequently asked of a transit information clerk involves the routes a patron must take to get from his origin to his destination. A mounted copy of the comprehensive transit map and an expanded street index should be supplied to the clerk for answering these questions. Since questions of this nature often involved specific addresses ("I'm at 465 West Elm Street; how do I get to 310 East Ashland Street?"), the street index provided the clerk must be much finer than that included on the standard comprehensive map. Each block of a street, major intersections, traffic generators, and points of interest in the area should be contained in this index. The index will enable the clerk to locate the caller's origin and destination on the map and so to locate the transit routes which will serve the patron's needs. Of course in the Brockton area, the clerk will quickly become familiar with almost all the area.

It is proposed that the DIME/GBF be printed out in street address format. Additionally, an intersection guide could be prepared and printed out in the same fashion, and a major generator guide developed from existing sources. In

order for a clerk to tell his caller the nearest point at which the desired bus can be boarded, the clerk needs a means of determining bus stops. Each stop in the system should be marked on the comprehensive map. To provide schedule information to callers, the clerk also needs complete timetables for each route.

C. Training of Information Clerks

Despite the accuracy of aids used by the information clerk and the efficiency of the telephone equipment at the information center, a telephone service can be more effective when its clerk can convey the requested information in an intelligible and courteous manner. Training should be aimed at providing the clerks with a general knowledge of the transit operation, and with specific knowledge of the information aids and equipment which they must use.

The need for, and the type of information clerk training to be provided is aptly described by the Nassau and Suffolk county report on Marketing Center:

"Even with the provision of a comprehensive group of information aids, an operator (telephone information clerk) will need a considerable amount of orientation and training. This should be directed both at how to answer requests (how to use the maps, schedules, streets, etc., as well as how to deal with the public) and also what bus service is provided (where routes go and what shopping center, hospital, etc. are on them)".¹

The complete training program for information clerks is a four-phase operation covering the use of existing system components, locational orientation, use of special informational devices, and the ways of conveying information to the public.

The first phase of this training should involve instruction in the basic uses of the other components of the information system. Clerks must understand how these information materials are used in order to clarify any problem encountered by patrons. Instructors for this might be chosen from among the designers of the information materials or from bus company supervisors and dispatchers. These people more than others, should have a solid working knowledge of the printed materials in the information system, and so are best equipped to give instruction in their use.

A clerk must also be familiar with the general area served by each route and with particular points along the route, if he is to provide locationally-related information. One method in which to present clerks with this information is in a series of lectures, reinforced with field trips. Bus drivers who are familiar with each route make excellent instructors for this phase of training. During the in-field work, instructors would be sent with the trainees to point out the areas discussed in the lectures and to quiz the student clerks in the relevant facts of each route.

Additionally, information clerks must be instructed in the mechanics of the

¹Klauder, Louis T. & Associates, Report on Marketing Center for Nassau and Suffolk County Bus Service, Philadelphia.

telephone service. Instruction in the proper use of machinery and of the information aids at their disposal should be given in this phase of training. The supervisor of the telephone service will probably be able to handle these topics easily; however, the designers of the information aids might also be called on to provide part of this instruction.

The final, though not least important, phase of training for telephone clerks involves instruction in dealing with the public. Telephone clerks must be aware that courtesy plays a major role in their transactions with patrons. The information clerk is a representative of BAT, and as such, may discourage people from using transit if his attitude toward the people served is grudging or rude. The telephone service, like every other transit information component, is designed to provide information for the public and to encourage the use of transit. A pleasant and courteous information clerk will have more success in accomplishing these objectives than one who is curt with the public. Again, the supervisor of the telephone service should be qualified to instruct clerks in this training. His role as supervisor requires "continuing instruction" in this area, in the sense that he must constantly check information clerks in the performance of their duties for the manner in which they deal with the public.

D. Equipment

Initially, equipment should be very simple - possibly nothing more than two telephone lines provided for BAT. The forecasted volume of calls does not support the purchase of anything but a minimal amount of equipment for this effort. If incoming calls can jump to the unused line, this should be adequate initially. Later, if the volume of calls warrants, more lines can be installed.

E. Publicity

In addition to printing the telephone number for this service on all informational materials, BAT should undertake an extensive publicity campaign to make people aware of the telephone information service. Advertisements should be run in the local paper, if possible on radio and television, and in the buses themselves, informing the public that a telephone information service is available for answering their transit questions. Special note should be made in the publicity that assistance can be obtained on the use of already existing printed materials from telephone information clerks. If it can be arranged, a catchy telephone number for the service, such as BUS RIDE, CALL BUS, (Exchange) INFO, or (Exchange) A BUS, will aid the public in remembering the number and the service).

F. The Place of a Telephone Service in a Transit Information System

Despite the all inclusive ability of a telephone information service to deal with patron inquiries, BAT should not be tempted to eliminate other information devices in favor of a telephone service. Since the tools discussed so far are much less costly than a telephone information service (it was estimated that the Port Authority of Allegheny County spends close to 25¢ per answered call - over half the price of an average fare¹) and since printed materials

¹LUMTA, Urban Mass Transportation Demonstration Project Allegheny County, Pennsylvania: Final Report - Project Pa-MTC-7, 1964, p. 22.

do not entail the ongoing monthly expenses involved in a telephone service, we encourage BAT to serve as many patrons as possible by presenting information through printed materials and signs. The telephone service should be thought of as a necessary component of the information system, and not as a replacement for these materials; the telephone service should provide information which is not available to patrons, and should answer transit questions for patrons who are ill-at-ease with other information tools. As a side effect, the telephone service which provides information quickly and courteously can be helpful to BAT's public image. The willingness of BAT to facilitate the public's search for information by answering transit questions on an individual basis, can only enhance its image. An information tool as convenient as the telephone service can make the prospect of a trip by transit more attractive than would otherwise be the case.

VII. Miscellaneous Sources of Information

The previous chapters dealt with information components which are needed by BAT and which would enjoy continuous usage by the public. There are other information dissemination techniques, however, whose value depends upon the transit system under consideration or upon the time of their application.

In this Chapter we will discuss some of the more common of these information devices; BAT should not consider these items as necessary to its information system. Rather BAT should consider these as possible additions which might enhance the information system or provide patrons with valuable supplementary transit information.

A. Non-English Communication

In Brockton and the region, there is a small minority of Spanish-speaking residents. Consideration of their needs requires that the telephone information service be capable of handling Spanish-speaking persons. Also, it may be possible to print a leaflet in Spanish to help interpret and use the standard maps and schedules.

B. Dissemination of Transit Information to the Community

Speaking engagements by the BAT Administrator before community groups can be an effective means of informing people about transit in the region. The Administrator can inform these groups of the services provided by BAT and can give instructions in the use of transit information tools. Neighborhood houses and senior citizen centers are organizations through which these potential patrons might be addressed, and which would probably welcome a speaker on the transit system as it relates to, and can be used by their members. The Administrator might also find a warm reception in schools. Reading timetables and maps can easily be tied into elementary or high school instruction.

C. Bus Driver

The bus driver is usually not thought of as part of the information system. The driver is, however, the one representative of BAT who has the greatest contact with patrons. It is only logical then, that he should be trained to answer their questions. While he is usually well versed in the service provided on his own route, it is possible that he lacks complete knowledge of the other routes in the system, and although most riders will question him about his route, it may not be uncommon for a rider to query him about the rest of the system. Drivers are trained to drive buses, but with a small amount of additional effort, they can be briefed in the workings of the entire transit system.

Among the transit companies considering the role of the bus driver as an information agent is the Bi-State Transit System in St. Louis. The following

statement on driver training illustrated the ways in which Bi-State trains its drivers to dispense passenger information:

"In addition to standard driver training, Bi-State's program exposes the trainee to "various general subjects he will need to know... the student (driver) is...thoroughly briefed on his responsibility to the system, the passengers, the community, and his fellow employees. This includes courtesy, safety, public relations, and care of equipment...the student learns about fares, the preparation and reading of schedules, reading of maps...Following this classroom experience, the student begins driving in regular passenger service under the guidance of selected operators who are working on routes to which this student will eventually be assigned...the 'inpassenger' service driving is continued until he has become familiar with all of the routes at his assigned division."¹

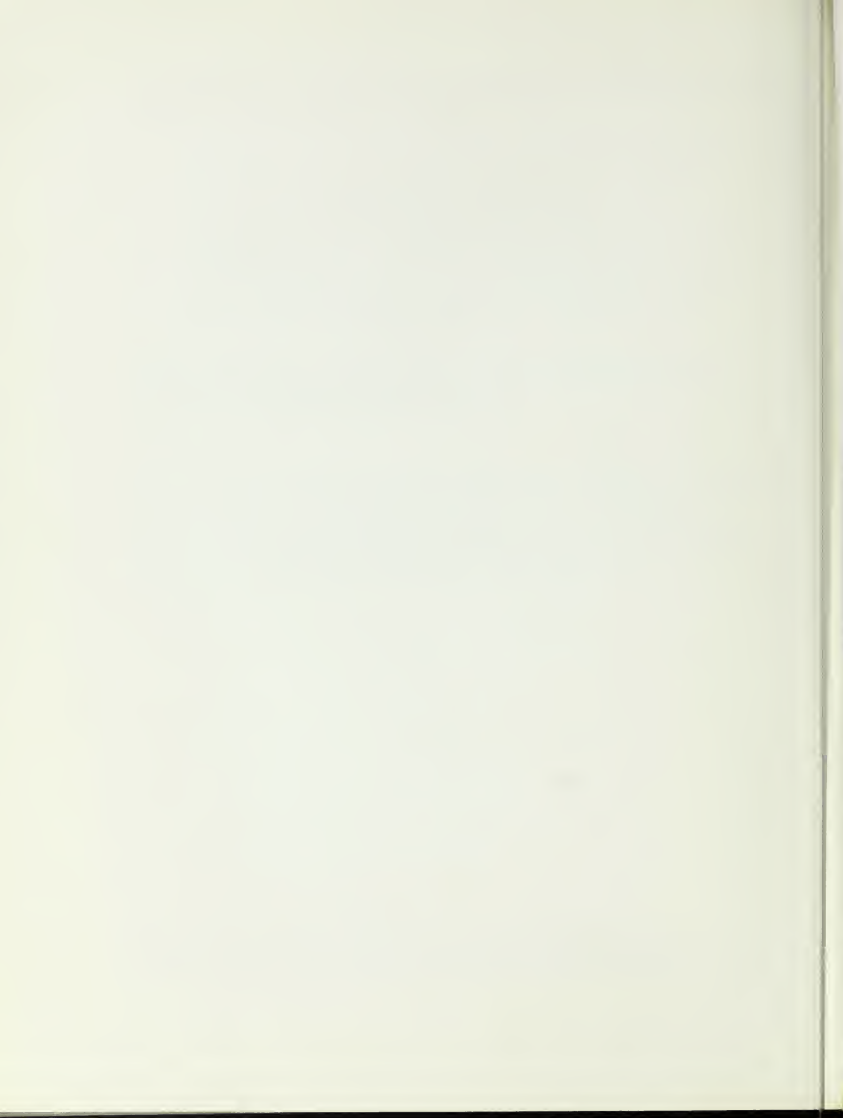
Brockton Area Transit might follow this example, or use a training program similar to that which is used to train the telephone information clerks. An incentive program such as "Driver of the Month", might help to encourage the drivers to use their training in the field.

D. Shelters

Transit shelters, like bus stop signs, signal points at which buses may be boarded, and by their very existence, impart transit information. In addition to this function, shelters provide an ideal location for displaying route maps and schedules for the routes which serve it. Moreover, shelters are usually large enough for displaying enlarged copies of the system schematic. In these ways, shelters are dispensers of transit information and can be considered correctly as part of a transit information system.

¹Bi-State Transit System, Summary of Operational and Administrative Procedures, Transit Services Corporation of Metropolitan St. Louis, October 1969, pp. 2-3.







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